
Soil Survey

Pickens County South Carolina

By

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SOIL SURVEY OF PICKENS COUNTY SOUTH CAROLINA

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INTRODUCTION

The soil survey map and report of Pickens County, S. C., are intended to convey information concerning the soils, crops, and agriculture of the county to numerous readers with varied interests.

Farmers, landowners, prospective purchasers, and tenants ordinarily are interested in some particular locality, farm, or field. They need to know what the soil is like on a certain piece of land, what crops are adapted, what yields may be expected, and what fertilization and other soil-management practices are necessary for best results. Many people do not wish to read the entire soil survey report, and they need not do so to obtain much of the information essential to their needs.

A person interested in a particular piece of land should first locate it on the colored soil map accompanying the report. Then, from the color and symbol, he can identify the soil by the legend on the margin of the map. By using the table of contents he can find the description of the soil type or types in the section on Soils. Under each soil-type heading is specific information about that particular soil, including a description of the landscape—lay of the land; drainage; stoniness, if any; vegetation; and other external characteristics—and the internal or profile characteristics of the soil—its color, depth, texture, structure, and chemical or mineralogical composition. This section also includes information about present land use, crops

¹ The field work for this survey was done while the Division was a part of the Bureau of Chemistry and Soils.

grown, yields obtained, possible land uses, and present and recommended management.

By referring to the section on Productivity Ratings the reader may be able to compare soil types as to productivity for various crops and suitability for growing crops or for other uses. Further ideas concerning land uses and management may be obtained from the section dealing with those subjects.

For the person unfamiliar with the county a general description of the county as a whole is included in the first part of the report under the section County Surveyed. Geography, physiography, regional drainage, relief, vegetation, climate, population, transportation facilities, and markets are discussed here. A brief summary at the end of the report gives a condensed description of the county and the more important facts concerning the soils and agriculture.

The agricultural economist and the general student of agriculture will be interested in the sections on Agriculture, Productivity Ratings, and Land Uses and Management.

Soil specialists, agronomists, experiment station and agricultural extension workers, and students of soils and crops will be interested in the more general discussion of soils in the section on Soils, as well as in the soil-type descriptions. They also will be interested in the sections on Productivity Ratings and Land Uses and Management.

For the soil scientist the section on Morphology and Genesis of Soils presents a brief technical discussion of the soils and of the soil-forming processes that have produced them.

COUNTY SURVEYED

Pickens County is in the northwestern part of South Carolina and borders North Carolina (fig. 1). It is roughly rectangular in shape.

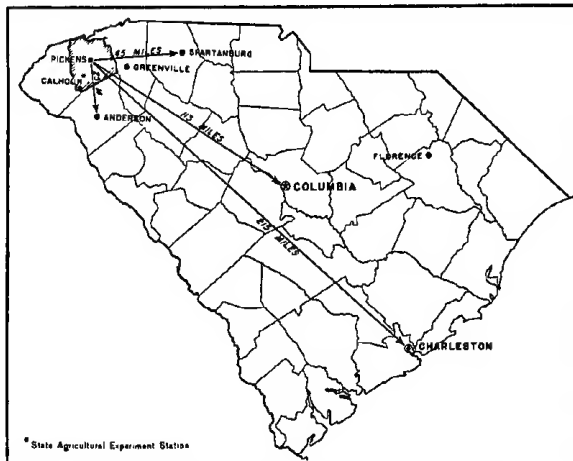


FIGURE 1.—Sketch map showing location of Pickens County, S. C.

The Seneca, Keowee, and Toxaway Rivers form the western boundary and separate it from Oconee County and the South Saluda, Middle Saluda, and Saluda Rivers form the northeastern boundary and separate it from Greenville County. Pickens, the county seat, is a

little south of the center of the county and is about 19 miles west of Greenville, Greenville County, 78 miles south of Asheville, N. C., and by air line about 115 miles northwest of Columbia, S. C. The total area of the county is 504 square miles, or 322,560 acres.

Pickens County lies within two of the physiographic provinces of the United States. A little less than four-fifths of the total area lies within the Piedmont province; the rest is in the foothills, or the southeastern rim, of the Blue Ridge province. The highest mountains are in the north-central and northwestern parts, and lower ridges or spurs extend well down into the Piedmont province. Several outlying knobs in the Piedmont province are 300 to 600 feet above the average elevation of the ridge tops in this section.

The Keowee, Toxaway, South Saluda, Middle Saluda, Saluda, and Oolenoy Rivers and Twelvemile, Big Eastatoe, and Eighteenmile Creeks and their tributaries form the main drainage system. Drainage in both physiographic provinces is to the southwest, south, and southeast; and the slope of the surface is in the direction of the main drainage. Nearly every farm is connected with this drainage system.

In general the relief of the area within the Piedmont province is that of a plain thoroughly dissected by drainageways, which either rise within the area or flow along its edges. The stream level ranges from 100 to 250 feet below the general elevation of the ridge tops. Most of the streams are rapid and have carved out narrow valleys, with overflow or bottom land, with a few feet to 300 feet wide in most places. In a few places, however, the bottom land is from 500 to 1,000 feet wide. The relief ranges from nearly level, undulating, or rolling land on the interstream areas to strongly rolling, hilly, or steep areas in places near the streams.

That part of the county lying within the Blue Ridge province and separated from the piedmont section by steep slopes or escarpments presents a rugged, steep topography. Elevations in this mountainous section range from 500 to 2,200 feet above the average elevation of the piedmont section. This part of the county has also been thoroughly dissected by drainage systems. In many places the swift streams have developed picturesque rapids and waterfalls. Except along Big Eastatoe Creek very little overflow, or bottom land, borders the mountain streams.

The average elevation above sea level in the piedmont section is about 1,000 feet, whereas in the mountainous section it is more than 3,000 feet. Elevations range from about 725 feet in the southern part of the county to 3,548 feet on Sassafras Mountain on the northern boundary. As shown by the United States Geological Survey bench marks, the elevation at Easley is 1,090 feet, about 2 miles southwest of Liberty 946 feet, Calhoun 727 feet, Six Mile 1,038 feet, Pickens 1,110 feet, Cross Roads 1,128 feet, Pumpkintown 967 feet, and Prices Store 1,152 feet.

Elevations² of other prominent mountain peaks are: Table Rock 3,157 feet, and Horse Mountain 2,919 feet. A United States Coast and Geodetic Survey bench mark on top of Pinnacle Mountain records an altitude of 3,440 feet, which is the highest point in the county.

The original forest growth³ consisted mainly of deciduous trees—

² The elevations are taken from the United States Geological Survey topographic map of the North Carolina-South Carolina Pisgah quadrangle.

³ RAMSEY, DAVID. HISTORY OF SOUTH CAROLINA FROM ITS FIRST SETTLEMENT IN 1670 TO 1808. 2 v., illus. Charleston. 1858.

white, post, red, black, pin, and chestnut oaks; hickory, beech, birch, ash, yellow poplar or tuliptree, sycamore, hemlock, chestnut, and black walnut, with some shortleaf pine and pitch pine mixed with the hardwoods on the uplands. The trees were large, and wagons could pass between them. Grasses and legumes carpeted the forest floor where there was sufficient light and space. The forests were practically free from brushy undergrowth, and canebrakes bordered the streams.

At present the forest vegetation consists of second- or third-growth trees of the various species of oak, with white, post, red, and black oak predominating, and hickory, dogwood, sycamore, beech, red gum, and tuliptree mixed with shortleaf pine (locally called oldfield pine) and pitch pine. On areas that have been cleared and abandoned shortleaf pine predominates. Some of the second-growth timber in the southern part of the county is scrubby and of little value, whereas in places in the northern part there is some fair hardwood and pine timber. The more important species are white oak (*Quercus alba* L.), red oak (*Q. maxima* (Marsh.) Ashe), black oak (*Q. velutina* Lam.), pin oak (*Q. palustris* Muench.), chestnut oak (*Q. prinus* L.), shagbark hickory (*Carya orata* (Mill.) K. Koch.), sycamore (*Platanus occidentalis* L.), chestnut (*Castanea dentata* (Marsh.) Borkh.), black walnut (*Juglans nigra* L.), shortleaf pine (*Pinus echinata* Mill.), pitch pine (*P. rigida* Mill.), and red gum (*Liquidambar styraciflua* L.).

Before 1798 Pickens County was a part of what was known as the Washington District,⁴ which was composed of the present Greenville, Anderson, Oconee, and Pickens Counties, from 1798 to 1828 it was a part of the Pendleton District, composed of the present Anderson, Oconee, and Pickens Counties; and from 1828 to 1868 it was a part of the Pickens District, composed of the present Oconee and Pickens Counties. In 1868 Pickens County was organized.

This territory was ceded to the State of South Carolina by the Cherokee Indians in 1777. Before this date there were very few if any white settlers in the area now embraced in Pickens County. For many years settlement in this section was slow. The early settlers came from other parts of the State or from Pennsylvania, North Carolina, Maryland, and Virginia. They were of English, German, Scotch, Irish, and French descent. The early settlements were along the larger streams, such as the Keowee River, Twelvemile Creek, and the Oolenoy River because the bottom lands were fertile and the streams furnished transportation. In general, settlement of the uplands spread from the southern part of the county toward the northern part, as the relief of the land in the southern part was more favorable for farming operations.

The Federal census reports a total population of 37,111 in Pickens County in 1940. The northern and northwestern parts are sparsely settled, whereas the population in the southern and southeastern sections in the vicinities of Central, Liberty, Pickens, Easley, and Dacusville is more dense. Most of the Negroes live in the southern part. The percentage of Negroes in this county is lower than in any other county in the State.

Pickens, the county seat, had a population of 1,637 in 1940. Other important towns are Easley, with a population of 5,183; Liberty, with 2,240; Central, with 1,496; and Calhoun, with 761. With the

⁴ CLAYTON, F. VAN. SETTLEMENT OF THE PENDLETON DISTRICT 1777-1800. [Unpublished master's thesis. Copy on file S. C. Univ.]

exception of Pickens, all are located in the southern part of the county. These towns are local markets and shipping points for cotton not used by local cotton mills. Norris, Six Mile, and Dacusville are other small towns or villages. Pickens County includes a part of the Clemson College property, although all the administration buildings are in Oconee County. Except for some cotton and live poultry shipped by railroad or truck to outside markets, practically all of the agricultural products are consumed locally. Greenville and Anderson furnish a market for some of the live poultry, and some is shipped to northeastern markets.

The main line of the Southern Railway from Washington to Atlanta crosses the southern part of the county, passing through the towns of Easley, Liberty, Central, and Calhoun, and furnishes excellent transportation and freight service to and from the county. The Pickens Railroad maintains freight service from Pickens to Easley. Passenger busses pass through the southern part of the county on their regular routes from Atlanta and other southern cities to eastern and northeastern cities. Federal and State hard-surfaced highways traverse the county in several directions, and the county maintains many miles of oil-treated roads that serve various parts. Graded sand-clay county roads reach nearly all sections. These sand-clay roads are in fair condition during dry weather, but during the winter and in rainy weather they are almost impassable in some places.

Excellent rural mail service reaches all parts of the county. Several rural post offices are conveniently located in the northern and northwestern parts. Telephone and electric services are not adequate. Probably 20 percent of the farm population has telephones, and about 10 percent has electric lights.

Pickens County has an excellent school system. Pickens, Easley, Liberty, Central, Calhoun, Six Mile, and Dacusville have accredited high schools. Wesleyan Methodist Junior College is situated just east of Central. Rural grammar schools are conveniently located and accessible. Many of the high-school students, as well as some of the grammar-school pupils, are transported to and from school by bus. Good church buildings are conveniently located in practically all sections.

Cotton processing is the chief industry. Nine cotton mills, manufacturing cotton cloth or other cotton goods, are operating in or near Pickens, Easley, Liberty, Central, and Norris. The county agent estimates that they consume about 85 percent of the cotton produced in the county. Lumbering is neither a large nor an important industry, but it furnishes employment to a number of people, especially during the winter.

CLIMATE

The climate is continental, mild, and healthful. The winters are cold but not rigorous except for short periods; the summers are hot but not oppressive for long periods. In the piedmont section the temperature is from 4° to 6° higher the year round than in the mountainous section. The average winter temperature is about 44° F. and the average summer temperature about 77.1° in the piedmont section; whereas in the mountainous section the average in winter is about 39.1° and in summer about 71.2°.

Rainfall is well distributed throughout the year in both physiographic divisions. The average annual rainfall in the piedmont section is about 55 inches, and in the mountainous section it is about 7 inches more. Occasional droughts or prolonged wet spells during the spring and summer cause some damage to crops. Climatic conditions are well suited to general farming, orcharding, livestock raising, and poultry raising. Farm work may be carried on throughout most of the year.

The average length of the frost-free season in the piedmont section is about 213 days, extending from April 1 to October 31. Killing frosts have occurred as late as April 23 and as early as October 8. The average frost-free season in the mountains is 6 or 7 weeks shorter.

The dry fall provides unusually favorable weather for picking cotton and harvesting corn, potatoes, and other crops, but in some years it is unfavorable for the sowing of wheat or the seeding of grass, as the seed will not germinate for a considerable time. As the ground freezes to only a slight depth and cold periods are of short duration, wheat, oats, rape, clover, turnips, collards, and other hardy crops can be grown successfully during the winter. Windstorms and hailstorms occur occasionally.

The data in table 1, compiled from records of the United States Weather Bureau station at Clemson College, Oconee County, S. C., are representative of climatic conditions throughout the southern part of Pickens County. In the northern part of the piedmont section near the mountains the temperature may average a little lower and the frost-free season may be somewhat shorter. The data in

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Clemson College, Oconee County, S. C.*

[Elevation, 850 feet]

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1925)	Total amount for the wettest year (1906)	Snow, average depth
	°F.	°F.	°F.	Inches	Inches	Inches	Inches
December.....	43.9	79	4	6.03	1.86	5.97	0.8
January.....	43.4	79	0	4.99	7.65	11.65	.7
February.....	44.8	82	-7	5.31	1.45	1.08	1.4
Winter.....	44.0	82	-7	10.33	10.86	18.70	2.9
March.....	52.4	89	12	5.14	2.67	8.02	.2
April.....	60.1	91	24	4.12	3.11	1.89	.0
May.....	68.6	99	36	4.34	1.78	2.74	.0
Spring.....	60.4	99	12	13.60	7.64	12.65	.2
June.....	75.6	100	42	4.77	1.35	5.67	.0
July.....	78.3	104	51	5.05	2.41	17.77	.0
August.....	77.5	104	52	4.89	.80	7.35	.0
Summer.....	77.1	104	42	14.71	4.06	30.79	.0
September.....	73.2	104	38	3.91	1.00	8.22	.0
October.....	61.9	92	25	3.54	5.84	4.11	(¹)
November.....	51.3	84	10	2.77	5.01	1.06	.2
Fall.....	62.1	104	10	10.22	11.85	14.59	.2
Year.....	60.9	104	-7	54.86	34.31	70.73	3.3

¹ Trace.

table 2, compiled from the records of the station at Brevard, Transylvania County, N. C., are representative of climatic conditions in the mountainous section.

TABLE 2.—Normal monthly, seasonal, and annual temperature and precipitation at Brevard, Transylvania County, N. C.

[Elevation, 2,230 feet]

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1925)	Total amount for the wettest year (1906)	Snow, average depth
	° F.	° F.	° F.	Inches	Inches	Inches	Inches
December.....	38.8	79	-12	5.80	1.95	6.36	2.2
January.....	38.5	74	-6	4.57	6.98	12.50	3.0
February.....	40.1	79	-5	4.40	1.02	1.60	2.6
Winter.....	39.1	79	-12	14.77	9.95	20.46	7.8
March.....	47.7	87	4	5.10	.85	8.90	.9
April.....	54.2	89	14	4.40	2.40	3.43	(¹)
May.....	62.9	93	25	5.58	1.97	3.60	.0
Spring.....	54.9	93	4	15.08	5.22	15.93	.9
June.....	69.3	95	36	5.80	1.09	14.77	.0
July.....	72.4	99	41	6.80	1.11	13.89	.0
August.....	72.0	99	40	6.60	.57	9.07	.0
Summer.....	71.2	99	36	19.20	2.77	37.73	.0
September.....	67.1	97	31	4.90	2.69	14.71	.0
October.....	56.5	90	15	4.90	4.81	6.09	(¹)
November.....	46.1	79	2	3.20	5.21	6.50	.9
Fall.....	56.6	97	2	13.00	12.71	27.30	.9
Year.....	55.5	99	-12	62.05	30.65	101.42	9.6

¹ Trace.

AGRICULTURE

Before the year 1777, what is now Pickens County was inhabited by the Cherokee Indians. They planted corn in small fields in the fertile bottom lands along the larger streams, but for the greater part of their food they relied on game from the surrounding forests and on fish from the streams.

Probably the first permanent settlements in this county were along the Keowee River, because the fertile bottom lands had been partly cleared by the Indians and the river furnished transportation. Later, settlements were established along other large streams. The early settlers confined their efforts largely to the cultivation of the fertile bottom lands, as the rolling uplands were thought to be of little value for farming. Gradually, however, settlements extended into the uplands. The smoother upland areas were occupied first, and then the more rolling lands. The population is now denser in the southern and southeastern parts of the county, where undulating and gently rolling lands are more extensive.

The early settlers grew corn, oats, wheat, flax, and other crops that could be consumed at home, fed to the livestock, or readily exchanged. Like the Indians, they also relied on fish and game for part of their food. Nearly every farmer raised hogs for pork and lard, and most of them kept a few cattle. Canebrakes bordering the streams

furnished excellent grazing for cattle. Practically everything the early settlers used was produced and manufactured at home. Cotton was introduced about 1802 and at first was grown in a small way for spinning and weaving into cloth at home. Because land was cheap and plentiful little attention was given to keeping it in a productive state. When a field became unproductive or run-down, it was abandoned and another cleared.

Cotton did not play an important part in the agriculture before the War between the States. Changes in the economic conditions of the South as a result of the war brought need for a ready cash crop, and improved transportation facilities made the production of cotton profitable. Cotton was then grown on an increasing scale and soon became the most important cash crop in the parts of the county where it could be grown successfully. From about 1910 to about 1930 the acreage in cotton exceeded that in corn.

According to the county agent, the average size of the farms in Pickens County has always been small, and, except for some farms in the southern part, cotton has never been grown to the exclusion of such crops as corn, oats, wheat, and garden vegetables. Subsistence crops, however, were not sufficient to meet local demands, until recent years, and consequently from about 1910 to 1930 hay and other feeds were shipped in. Very little attention was given to soil-building crops and to systematic rotation of crops. Because most of the cultivated land is undulating to strongly rolling, farmers soon realized the need for terracing. As a result the proportion of severely eroded and gullied land in this county is small as compared with that of some piedmont counties farther south. Since about 1930 there has been a general tendency toward diversification of agriculture. One main reason for this has been the low price of cotton. The cotton acreage has decreased and the acreage of wheat, oats, cowpeas, soybeans, and other soil-building crops has increased. For instance, in 1929 cowpeas were grown on only 262 acres and in 1934, on 4,261 acres. More attention is now given to the rotation of crops.

Table 3, compiled from the Federal census reports, gives the acreage of the more important crops grown in stated years from 1879 to 1934.

TABLE 3.—*Acreage of principal crops in Pickens County, S. C., in stated years*

Crop	1879	1889	1899	1909	1919	1929	1934
	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>
Corn for grain.....	27,070	28,041	37,737	32,937	32,430	25,314	33,229
Cotton.....	18,463	24,128	28,964	34,221	37,945	39,006	25,239
Oats:							
Threshed.....	2,882	6,486	2,153	3,670	2,616	1,170	1,887
Unthreshed.....						4,661	6,165
Wheat.....	4,994	5,699	7,650	3,330	2,212	770	4,304
Hay and forage.....		434	1,258	1,303	15,100	2,198	6,978
Sweet potatoes.....	251	667	449	620	875	431	922
Sorgho.....		489	276	362	853	251	
Rye.....	237	252	259	180	256	201	194
Potatoes.....		92	25	212	256	277	286
	<i>Trees</i>	<i>Trees</i>	<i>Trees</i>	<i>Trees</i>	<i>Trees</i>	<i>Trees</i>	<i>Trees</i>
Apple.....		12,180	31,764	31,815	23,144	16,493	22,695
Peach.....		18,785	24,284	37,456	28,011	28,032	28,510

¹ Of this acreage, 13,763 acres was in corn for forage.

² For the year 1890.

³ For the year 1900.

⁴ For the year 1930.

⁵ For the year 1935.

The census figures clearly indicate the order of importance of the different crops. The acreage planted to corn has been the most stationary, whereas the acreages in oats and wheat have fluctuated from year to year. Cotton showed a steady increase in acreage from 1879 to 1929 and a decided decrease in 1929 and 1934, when it was partly replaced by oats, wheat, and hay crops. Corn has always been an important crop in Pickens County even in the years 1909 to 1929. This is due to the fact that the northern part of the county is not adapted to cotton growing, and the area of bottom land, which is especially adapted to the production of corn, is fairly large.

Table 4 shows the value of agricultural products, by classes, for the years 1909, 1919, and 1929, as reported by the Federal census.

TABLE 4.—*Value of agricultural products, by classes, in Pickens County, S. C., in stated years*

Products	1909	1919	1929
Cereals.....	\$461,476	\$1,142,763	\$484,960
Other grains and seeds.....	4,468	27,665	5,048
Hay and forage.....	21,517	150,957	27,856
Vegetables, including potatoes and sweet potatoes.....	116,989	338,407	96,977
Fruits and nuts.....	53,489	41,452	26,809
All other field crops ¹	1,205,410	4,776,631	2,065,974
Vegetables, excluding potatoes and sweet potatoes for home use.....			128,996
Forest products, cut on farms, for home use and for sale.....			146,721
Livestock products:			
Dairy products sold.....	17,415	76,084	124,299
Poultry and eggs produced.....	104,213	230,173	321,358

¹ Listed in 1909 and 1919 as "All other crops." This item consists largely of cotton.

The use of commercial fertilizer is general. Practically every farmer uses it, and most of it is bought ready-mixed. Nitrate of soda or sulfate of ammonia is applied as a side dressing by a majority of the farmers. According to the Federal census, in 1929, 3,316, or 89.7 percent, of the farmers of the county purchased fertilizer, amounting to \$358,157. Fertilizer mixtures commonly used are as follows: 4-8-4,⁵ 5-7-5, 3-8-3, and 4-10-4. It is a common practice for the fertilizer manufacturers to use dolomitic limestone as a filler in place of the inert materials formerly used; otherwise very little limestone is used.

Most of the farm labor is done by the operators of the farms and their families. Some labor, however, is hired at 75 cents to \$1 a day, and some at \$12 to \$15 a month with room and board. The supply of labor is sufficient to meet the demand. According to the 1930 census, 18.2 percent of the farms reported an expenditure of \$67,242 for labor, or an average of \$99.77 a farm reporting.

The size of the farms varies, but about 80 percent of them range from about 10 to 100 acres. The average size of the farms in 1880 was 120 acres; in 1930, 59.5 acres; and in 1935, 64.5 acres.

According to the 1935 census, 39.9 percent of the farms were operated by owners, 59.9 percent by tenants, and 0.2 percent by managers. Tenants are designated as either tenants or sharecroppers.

The prevailing system of rental by tenants is the share system, in which the landlord furnishes the land, work animals, feed for the work animals, implements, seed and one-half of the fertilizer, and

⁵ Percentages, respectively, of nitrogen, phosphoric acid, and potash.

in return receives one-half of all crops. In another system of rental the landlord furnishes the land, may or may not furnish the dwelling house, pays for one-third of the fertilizer, and receives one-third of the crop as rent. A few farms are rented for a stated cash rent per acre of cultivated land.

At present the agriculture consists of the production of cotton, as the main cash crop, and of corn, oats, wheat, and hay as the principal crops for sustenance. In addition, sweetpotatoes, garden vegetables, and some barley, cowpeas, potatoes, sorgo, apples, and peaches are grown, mainly for home use, but a few of these products are sold locally. On practically every well-established farm milk cows are kept, hogs are raised, and the farmers have chickens for home use and poultry products for sale.

About 27 percent of the total area is devoted to crops. The rest is abandoned land (that is, land that has become eroded, leached, and in places unsuitable for crops), pasture land, or forest land.

According to the census of 1935, in 1934 there were 33,757 acres planted to corn; 25,239 acres to cotton; 8,043 acres to oats, of which 1,887 acres were threshed and 6,156 acres cut and fed unthreshed; 4,304 acres to wheat; and 6,978 acres to hay and forage crops. Corn is used for feeding work animals, fattening hogs, and as meal for home consumption. Cotton is today and has been since the War between the States practically the only cash crop grown. It receives more attention than any other crop and is the basis for credit. Both the soil and climatic conditions in the southern part of the county favor the growing of cotton. There is a tendency toward the growing of more feedstuff and food for home consumption and also for the growing of more soil-building crops, such as cowpeas, soybeans, and lespedeza.

Most of the farm buildings are of the frame type and vary in size and in condition. Some are painted and well kept.

Mules furnish the chief draft power, although some horses and a few tractors are used. The average farm equipment consists of one-horse plows, one- and two-horse turning plows, one-horse cultivators, spike-tooth harrows, disk harrows, a fertilizer drill, cotton and corn planters, and a farm wagon. There are a few two-horse riding and walking cultivators.

Most of the hogs are of the Poland China, Berkshire, Duroc-Jersey, and O. I. C. breeds. There are some purebred boars and sows of these breeds in the county. Dairy cows are mostly grade Jerseys and Guernseys, although there are a few purebred bulls and cows of these breeds.

There are several commercial apple orchards, and practically every well-established farm has a few fruit trees for home use.

Practically all of the pork, beef, dairy products, and fruit is consumed locally.

SOIL SURVEY METHODS AND DEFINITIONS

Soil surveying consists of the examination, classification, and mapping of soils in the field.

The soils are examined systematically in many locations. Test pits are dug, borings are made, and exposures, such as those in road or railroad cuts, are studied. Each excavation exposes a series of distinct soil layers or horizons, called collectively the soil profile. Each hori-

zon of the soil as well as the parent material beneath the soil is studied in detail; and the color, structure, porosity, consistence, texture, and content of organic matter, roots, gravel, and stone are noted. The reaction of the soil⁶ and its content of lime and salts are determined by simple tests. The drainage, both internal and external, and other external features, such as the relief or lay of the land, are taken into consideration, and the interrelation of the soils and vegetation is studied.

The soils are classified according to their characteristics, both internal and external, special emphasis being given to the features influencing the adaptation of the land for the growing of crop plants, grasses, and trees. On the basis of these characteristics soils are grouped into mapping units. The three principal units are (1) series, (2) type, and (3) phase. In places two or more of these principal units may be in such intimate or mixed pattern that they cannot be clearly shown separately on a map but must be mapped as (4) a complex. Areas of land, such as coastal beach or rock outcrop, that have no true soil are called (5) miscellaneous land types.

The most important of these groups is the series, which includes soils having the same genetic horizons, similar in their important characteristics and arrangement in the soil profile and developed from a particular type of parent material. Thus, a series includes soils having essentially the same color, structure, and other important internal characteristics and the same natural drainage conditions and range in relief. The texture of the upper part of the soil, including that commonly plowed, may vary within a series. The soil series are given names of places or geographic features near which they were first found. Thus Cecil, Appling, Madison, Porters, and Hayesville are names of important soil series.

Within a soil series are one or more soil types, defined according to the texture of the upper part of the soil. Thus, the class name of the soil texture, such as sand, loamy sand, sandy loam, loam, silt loam, clay loam, silty clay loam, and clay, is added to the series name to give the complete name of the soil type. For example, Cecil sandy loam and Cecil clay loam are soil types within the Cecil series. Except for the texture of the surface soil, these soil types have approximately the same internal and external characteristics. The soil type is the principal unit of mapping, and, because of its specific character, it is usually the soil unit to which agronomic data are definitely related.

A phase of a soil type is a variation within the type that differs from the type in some minor soil characteristic having practical significance. Differences in relief, stoniness, and the degree of accelerated erosion are frequently shown as phases. For example, within the normal range of relief for a soil type some areas may be adapted to the use of machinery and the growth of cultivated crops and others may not. Even though no important differences are apparent in the soil itself or in its capability for the growth of native vegetation throughout the range in relief, important differences may exist in respect to the growth of cultivated crops. Under such conditions the more sloping parts of the soil type may be segregated on the map as a sloping or a hilly phase. Similarly, soils having differences in stoniness may be mapped

⁶ The reaction of the soil is its degree of acidity or alkalinity, expressed mathematically as the pH value. A pH value of 7 indicates precise neutrality, higher values indicate alkalinity, and lower values indicate acidity.

as phases, even though these differences are not reflected in the character of the soil or in the growth of native plants.

The soil surveyor makes a map of the county or area, showing the location of each of the soil types, phases, complexes, and miscellaneous land types in relation to roads, houses, streams, lakes, section and township lines, and other local cultural and natural features of the landscape.

SOILS

Pickens County lies in both the Piedmont province and the Blue Ridge province of the Appalachian Highlands physiographic division. Slightly more than three-fourths of the county is in the Piedmont province, and the rest is in the Blue Ridge province. This county probably contains a higher percentage of rolling, hilly, steep, and mountainous land than any other county in South Carolina. The relief ranges from gently rolling or rolling to hilly and mountainous. All the soils of the uplands have good surface and internal drainage, as they have slopes of 2 to 15 percent in the smoother part of the county and up to 80 percent in the rougher part. Some of the soils in the first bottoms and on a few of the adjacent slopes are poorly drained. Much of the land that has been under clean cultivation for a long time, particularly on the more sloping areas, has undergone accelerated erosion, and in places gullies have formed. In some places formerly good agricultural land has been practically destroyed by surface washing and gullying.

The soils of the uplands have developed through soil-forming processes from the disintegrated products of granites, gneisses, schists, and dark-colored basic rocks. Soils of the Cecil, Hayesville, Appling, and Porters series have developed mainly from granites and gneisses, the Madison soils owe their origin to the disintegration of quartz mica schists, and the Lloyd soils have developed from the weathered products of mixed light-colored acidic rocks and dark-colored basic rocks. In the mountainous part of the county the Porters soils predominate. These soils have developed from practically the same kind of materials as have the Cecil and Hayesville, but, owing to their high elevation and different climatic conditions, both the surface soils and the subsoils are more friable throughout than the corresponding layers of those soils and contain more organic matter. The Wickham and Altavista soils occur on smooth terraces and lie above normal overflow. These soils consist of sediments washed from the soils of the Piedmont section and of the mountains and deposited when the streams flowed at higher levels. These materials have lain in a well-drained position long enough to have developed normal soil profiles. The Congaree soils and alluvial soils (Congaree soil material) are developed from the more recent sediments brought down by streams and deposited in the present flood plains.

Fourteen types and nine phases of soil are delineated on the accompanying soil map. In addition to these types and phases, alluvial soils (Congaree soil material), rough gullied land (Cecil soil material), rough stony land (Porters and Hayesville soil materials), and rock outcrop are mapped. In the mountainous part of the county the soils occur in rather large continuous areas, but throughout the rest of the county areas of individual soil types or phases are small and somewhat scattered. These soils vary considerably in their physi-

cal characteristics, depending on the character of the parent material, drainage conditions, vegetation, and geological erosion.

In texture the soils of Pickens County range from sandy loams to clay loams and in color from light gray to brown or red in the surface layer. The subsoils vary in texture, color, consistence, and porosity; In the piedmont section, they range from stiff, brittle red clay to stiff, brittle yellowish-red clay, whereas the subsoils of the Porters soils of the mountainous section are dominantly brown clay loam and are prevailingly friable throughout. In many places the thickness of the surface layer of the sandy loam or loam soils has been reduced considerably by accelerated erosion. In some of the steep and hilly areas the subsoil is comparatively thin because geological erosion has kept almost an even pace with soil formation.

All the soils of the piedmont section are low in organic matter, as they have developed under a forest cover where conditions have not been favorable for the accumulation of large quantities of decaying vegetation. In virgin areas a thin layer of partly decomposed leaf-mold, leaves, or pine needles covers the surface, and the surface soil to a depth of 1 or 2 inches contains a small quantity of organic matter. The organic matter soon disappears, however, when the soil is brought under clean cultivation. Leaching of the mineral plant nutrients continues throughout the greater part of the year. The soils range from slightly to very strongly acid. In their natural condition the Lloyd soils are the least acid of the soils of the county.

In the southern and southeastern sections of the county are the more extensive areas of undulating gently rolling to rolling lands. A large part of these soils has been cleared and farmed at one time or another. At present the forests consist principally of second- or third-growth trees of various kinds. On areas once cleared, cultivated, and abandoned, shortleaf or oldfield pines predominate: On the more recently abandoned areas little vegetation exists except broomsedge, briars, and a scattering growth of oldfield or shortleaf pines with a few oaks. Practically all the merchantable timber in the piedmont section has been cut and also a large part in the more accessible areas of the mountains. Nearly all of the Porters soils, the steep phases of the Hayesville, and some of the hilly areas are in forest. According to an estimate from the 1935 census, about 30 percent of the county, or 103,356 acres, was in cropland and in plowable pasture in 1934. Some of the woodland is devoted to pasture.

All the soils of the uplands now in cultivation in the piedmont section, irrespective of soil type, are used to some extent for the production of general farm crops, such as cotton, corn, small grains, hay, and forage crops. These crops are well distributed over the county. The effects of the boll weevil have never been serious in Pickens County, and cotton can be grown practically as successfully on the heavy-textured soils as on the light-textured soils. Yields of crops vary on different soil types, owing to differences in inherent fertility, past history, management, and the quantity of fertilizer applied. No important crop is grown in any one locality or on any definite soil type or phase, with the exception of the first-bottom soils, which are devoted almost exclusively to the production of corn. A few scattered areas in the mountainous part of the county, where the relief is favorable

for cultivation, are used for growing corn, garden vegetables, especially cabbage, and potatoes. Apples are grown to a small extent.

Corn is grown largely on the Congaree soils on the first bottoms, which are fairly well distributed throughout the county. It is the most important crop in the northern part.

The soils of Pickens County have been placed in four groups, based on the fundamental characteristics of the soils that have an effect on the growth of cultivated crops, grasses, and trees. In this grouping the internal characteristics of the soil, together with slope, erosion, and drainage conditions, have been considered. Slope, one of the important external factors, determines in large measure the use of the soil. Soils of the smoother uplands, terraces, and well-drained bottom lands include the best agricultural soils and those that have the most favorable relief on the uplands. Soils of the hilly uplands include soils mapped as hilly phases and those that have a strongly rolling to hilly relief. Soils of the steep and mountainous areas include the soils of steep areas of the piedmont section and soils of the mountainous section. Miscellaneous soils and land types are so considered because of poor drainage, gullied condition, rugged relief, or stoniness.

In the following pages the soils of Pickens County are described in detail and their agricultural relationships are discussed; their location and distribution are shown on the accompanying soil map and their acreage and proportionate extent in table 5.

TABLE 5.—*Acreage and proportionate extent of the soils mapped in Pickens County, S. C.*

Soil type	Acres	Per- cent	Soil type	Acres	Per- cent
Cecil sandy loam.....	9,152	2.8	Lloyd clay loam, hilly phase.....	1,024	0.3
Cecil sandy loam, eroded phase.....	75,008	23.3	Hayesville loam, hilly phase.....	8,128	2.5
Appling sandy loam.....	448	.1	Porters loam, smooth phase.....	704	.2
Madison gravelly sandy loam.....	4,736	1.5	Hayesville-Madison loams, steep		
Worsham sandy loam.....	1,088	.3	phases.....	29,888	9.3
Hayesville sandy loam.....	1,856	.6	Hayesville loam, steep phase.....	38,912	12.1
Hayesville loam.....	4,608	1.4	Porters loam.....	14,016	4.3
Cecil clay loam.....	22,848	7.1	Porters fine sandy loam.....	12,992	4.0
Lloyd clay loam.....	2,176	.7	Alluvial soils (Congaree soil ma-		
Wickham loam.....	320	.1	terial).....	18,112	5.6
Altavista loam.....	256	.1	Rough gullied land (Cecil soil ma-		
Congaree fine sandy loam.....	6,336	2.0	terial).....	6,912	2.1
Congaree silt loam.....	2,688	.8	Rough stony land (Porters and		
Cecil sandy loam, eroded hilly			Hayesville soil materials).....	7,296	2.3
phase.....	31,616	9.8	Rock outcrop.....	192	.1
Madison gravelly sandy loam,					
hilly phase.....	1,216	.4			
Cecil clay loam, hilly phase.....	20,032	6.2	Total.....	322,560	100.0

SOILS OF THE SMOOTHER UPLANDS, TERRACES, AND WELL-DRAINED BOTTOM LANDS

Cecil sandy loam; Cecil sandy loam, eroded phase; Appling sandy loam; Madison gravelly sandy loam; Worsham sandy loam; Hayesville sandy loam; Hayesville loam; Cecil clay loam; Lloyd clay loam; Wickham loam; Altavista loam; Congaree fine sandy loam; and Congaree silt loam occupy the smoother uplands, terraces, and well-drained bottom lands. These soils have the most favorable relief of all the soils of the county. The surface is undulating, gently rolling, or rolling, having a slope of 2 to 12 percent (pl. 1, A and B). Their texture, structure, and consistence are also favorable, and improved farm machinery can be operated successfully on most of them.

Both surface and internal drainage are good. On some of the more sloping areas that have been under clean cultivation for a long time, sheet erosion has removed some of the original surface soil. This group of soils is by far the most important in the county, occupying about 41 percent of the total area. The greater part of all the crops commonly grown are produced on these soils.

This group of soils may be subdivided into two subgroups on the basis of formation of the parent material. Those of the first subgroup—the Cecil, Madison, Hayesville, Appling, and Worsham soils—have developed from weathered products of granites and gneisses, whereas the Lloyd soils have developed from the same kind of rock together with a mixture of basic rocks. The Hayesville soils closely resemble the Cecil soils in color but differ from them in having lighter red or yellowish-red subsoils that have more variation in color and in depth and are more friable. In general, the Hayesville soils are not so deep as the Cecil soils. They occur in the northern part of the county at the base of the mountains, on the lower part of the southern mountain slopes, in the mountain valleys, on the low-lying spurs that protrude into the piedmont section, and on the outlying knobs that rise 300 to 400 feet above the general elevation of the piedmont section.

The second subgroup comprises the Wickham, Altavista, and Congaree soils. The Wickham and Altavista soils occur on terraces and consist of sediments washed from soils in the piedmont and mountainous sections, and the Congaree consist of more recently deposited materials from the same source. There is considerable variation in the texture and color of the surface soils as well as in the color, texture, and consistence of the subsoils.

All the soils of this group with the exception of Madison gravelly sandy loam are practically free of stone or gravel, yet in places angular pieces of quartz gravel from 1 to 3 inches in diameter are scattered over the surface. The more gravelly areas are shown on the soil map by gravel symbols. In only a few places does gravel occur in sufficient quantities to interfere with cultivation. All the soils range from moderately acid to strongly acid in reaction. Lloyd clay loam is the least acid soil in the county.

Although leached and deficient in organic matter, these soils can be built up to a rather high state of productivity, and this productivity can be maintained by growing and turning under leguminous crops, adding barnyard manure, and using proper rotations. The subsoils hold most of the fertilizers and manures. These soils respond readily to good management. On some of the more sloping areas, kudzu and lespedeza together with terraces and strip crops would in a large measure control accelerated erosion.

Cecil sandy loam.—The surface soil of Cecil sandy loam in cultivated fields is light grayish-brown or yellowish-brown loose, friable light sandy loam from 4 to 6 inches thick. At a distance the surface appears light gray. In forested areas there is a thin covering of partly decomposed organic debris on the surface, and the topmost 2 or 3 inches of the surface soil is dark grayish-brown mellow sandy loam that contains a fair quantity of organic matter and is well matted with small roots. The soil particles in this layer tend to cling together, showing a soft granular structure. In most places between the surface soil and the subsoil there is a 2- to 4-inch

transitional layer of yellowish-red or reddish-yellow sandy clay loam that is firm in place but friable.

The upper part of the subsoil is red stiff but brittle clay containing a small quantity of sharp quartz grains. It is sticky when wet, but when dry it is hard and breaks into irregular fragments or clods that are easily crushed to a friable crumbly mass. It is permeable to air and water, and roots readily penetrate it. At a depth of 24 to 30 inches this grades into the lower part of the subsoil, which consists of light-red and yellowish-red more friable clay or clay loam. The subsoil is underlain at a depth of 36 to 40 inches by light-red soft disintegrated and partly decomposed gneiss and other crystalline rock materials that are mottled or streaked with yellow, brown, and gray. This material rests on bedrock at a varying depth. The content of mica in Cecil sandy loam varies from place to place, but the lower part of the subsoil generally contains a noticeable quantity of mica flakes and considerable gritty material. The texture, friability, and depth of the soil vary.

In cultivated areas of Cecil sandy loam there are small spots where part or all of the original sandy surface soil has been removed by sheet erosion, and these areas are reddish brown or red. In places the subsoil is yellowish-red or light-red clay, especially in places where Cecil sandy loam is associated with Appling sandy loam. In places the lower part of the subsoil contains yellow mottlings or streaks. Cecil sandy loam is not an extensive soil. Small areas are scattered over the comparatively smooth interstream divides in the piedmont section, being most prominent in the southern and eastern parts of the county. The land is nearly level or undulating, the slope ranging from 2 to about 6 percent. External and internal drainage are good; but, owing to its sandy surface layer, this soil has a comparatively high water-holding capacity.

About 60 percent of the land is cultivated; the rest is in forest consisting mainly of second-growth white oak, post oak, shortleaf pine, dogwood, and hickory.

Cecil sandy loam is one of the best soils for general purposes in the county, although it is not inherently the strongest. It warms early in the spring, retains moisture and applied fertilizers, and responds to fertilization. It can be worked under a wide range of moisture conditions. As the relief is favorable for farming operations, only moderate power is sufficient for all cultural operations and light farming implements are adequate.

About 60 percent of the cultivated land is devoted to cotton, 25 percent to corn, and the rest to oats, wheat, cowpeas, sweetpotatoes, hay and forage crops, orchard fruits, and summer vegetables. Cotton yields from 200 to 500 pounds of lint cotton an acre and averages 350 pounds when from 250 to 400 pounds of 3-8-3, 4-8-4, or 5-7-5 commercial fertilizer is applied at planting time and about 100 pounds of nitrate of soda (a part of which may be sulfate of ammonia) added as a side dressing when the plants are a few inches high. When cotton rust is prevalent, 50 pounds of potash in the form of muriate of potash is added with nitrogen as a top dressing if a low-grade fertilizer is used. Unless corn follows cotton on land that was heavily fertilized, the land usually receives 100 to 200 pounds of 4-8-4 commercial fertilizer at the time the corn is planted, and a side dressing of 75 to 100 pounds of nitrate of soda, or sulfate of ammonia,



Characteristic relief of the soils of the smoother uplands: *A*, Cecil sandy loam, eroded phase; *B*, Cecil clay loam in the foreground and Cecil sandy loam in the background.

when the plants are from 2 to 3 feet high. Corn yields from 12 to 25 bushels an acre. Oats usually receive 100 to 150 pounds of a 4-8-4 mixture unless they follow cotton and 75 to 100 pounds of nitrate of soda as a side dressing in the spring when they start their growth. Oats yield from 15 to 30 bushels an acre. A large part of the crop is cut green, cured, and fed in the sheaf. Oats and vetch are often planted together for forage. Other hay or forage crops commonly grown are cowpeas, cowpeas and sorghum, soybeans and sorghum, velvetbeans and sorghum, and lespedeza. These crops are not usually fertilized. Lespedeza yields $\frac{3}{4}$ to 1 ton of hay an acre and the other hay crops from $\frac{1}{4}$ to 2 tons. Very little wheat is produced on this soil, but wheatland receives in general 200 to 250 pounds of 4-8-4 fertilizer at planting time, and the crop is not so commonly side-dressed as are oats and corn. Wheat yields from 8 to 12 bushels an acre. Land devoted to sweetpotatoes and vegetables receives from 300 to 600 pounds of fertilizer along with barnyard manure. The yield of sweetpotatoes is 80 to 150 bushels an acre, and where the land is heavily fertilized with a high-grade mixture yields of 150 to 300 bushels may be obtained.

Some terracing is necessary on most of this soil in order to control surface run-off and to prevent the washing away of the sandy surface layer. This soil can be built up to fair productivity and maintained in that state by growing and turning under green-manure and leguminous crops and by adding barnyard manure.

Cecil sandy loam, eroded phase.—Cecil sandy loam, eroded phase, differs from typical Cecil sandy loam in the variability of its texture and depth of surface soil, which is due to accelerated or sheet erosion. It represents areas of Cecil sandy loam on undulating and gently rolling to rolling land where erosion, induced by improper management of the soil, has removed part or all of the sandy loam surface soil from small spots over the fields. About half of the area still has the 4- to 6-inch sandy loam surface covering, whereas the rest retains only a mere film or has lost all the sandy loam covering, exposing the red clay subsoil in places. From some slopes the sandy surface material has been removed and deposited at the base of the slope or in the basinlike areas. Plowed fields present a spotted appearance of light grayish brown, reddish brown, or red. The brown and red colors are intensified when wet. Thus, the surface color varies and the texture ranges from sandy loam to sandy clay loam or clay loam. The subsoil is essentially the same as that of typical Cecil sandy loam.

A few small areas of Louisa loam east and northeast of Pickens and south of Liberty are included with Cecil sandy loam, eroded phase, because of their small extent. These areas have developed from highly micaceous rock materials, and, owing to the slow rate at which this material decomposes, the profiles have not yet become well developed. In an area about 2 miles southeast of Liberty on United States Highway No. 178, the surface soil, where present, is reddish-brown highly micaceous friable loam ranging from a mere film to 7 inches in thickness. The subsoil is yellowish-red highly micaceous loose and friable clay loam that grades into soft, highly micaceous, partly decomposed rock material at a depth of 24 to 30 inches. Both the surface soil and the subsoil have a greasy feel and shine when rubbed between the fingers, and the surface glistens in the sunlight because of the high content of mica flakes. Also, west of

Pickens and in the vicinities of Six Mile, Cateechee, and Norris, where the Cecil and Madison soils grade imperceptibly into each other, small areas are included that have a higher content of mica flakes and are more friable throughout the profile than the typical Cecil soils.

Cecil sandy loam, eroded phase, is by far the most extensive soil in this county. It occurs throughout the piedmont section, especially in the southeastern and extreme east-central parts. The land is undulating and gently rolling or sloping to rolling, having a gradient of from 3 to about 12 percent. In general, the slopes are fairly long and uniform. Natural drainage is good.

Probably 75 percent of this soil is under cultivation, 5 percent in Bermuda grass pasture, and the rest in scrubby oak and pine timber. About 60 percent of the cultivated land is devoted to cotton, 25 percent to corn, 10 percent to oats, wheat, and hay and forage crops, and the rest to sweetpotatoes, home gardens, and orchard fruits. This soil is well adapted to the production of cotton, corn, and the general crops of the area. About the same fertilizer practices are followed as on the Cecil sandy loam, and about the same or slightly lower yields are obtained.

Areas of Cecil sandy loam, eroded phase, are not so easily managed as areas of typical Cecil sandy loam, owing to the sandy clay or clay loam spots over the fields. This eroded soil cannot be worked so soon after a rain as the sandy loam, and the sandy clay and clay loam spots are affected more by drought than are areas of the typical soil. Proper terracing to control run-off of surface water and proper cultural methods are necessary to prevent further erosion and consequent increase in the size of the eroded spots. On slopes steeper than 6 percent strip cropping should be practiced; that is, close growing crops should be interplanted with clean-cultivated crops. Very little of this soil occurs on slopes steeper than 10 percent.

Appling sandy loam.—In cultivated fields the surface soil of Appling sandy loam to a depth of 4 to 6 inches consists of yellowish-gray mellow friable light sandy loam. In forested areas to a depth of $\frac{1}{2}$ to 2 inches the soil is fairly dark grayish-brown light sandy loam well matted with small roots and containing a small quantity of partly decomposed organic matter. This is underlain by grayish-yellow or grayish-brown friable light sandy loam to a depth of 6 or 8 inches. This material grades into light-yellow or yellow sandy loam that continues to a depth of about 12 inches. The subsoil of yellow to reddish-yellow heavy sandy clay or friable clay reaches to a depth of 16 to 20 inches, where it passes into banded or streaked light-red, yellow, and gray stiff but brittle clay. At a depth of 35 to 42 inches this clay is underlain by soft disintegrated and partly decomposed mingled red, light-yellow, and gray gneiss or other crystalline rock material.

The Appling soils are not well developed in this county, and the subsoils vary in color, grading toward the typical Cecil soils on the one hand and to the typical Durham soils on the other. In cultivated fields the depth and the color of the surface soil vary, owing mainly to accelerated erosion.

Several small areas of closely associated Durham sandy loam are included with Appling sandy loam. Two of these areas are $1\frac{1}{2}$ miles south and a short distance east of Rock Springs Church in the south-

eastern part of the county, and another small area is about $1\frac{1}{2}$ miles southwest of Pickens. The Durham soils differ from the Appling soils in the color of the lower subsoil layer, which is predominantly yellow, but in places a few reddish-yellow or light-red spots or streaks appear in the lower part. In places a small quantity of angular quartz gravel is scattered over the surface of the Appling sandy loam but not enough to interfere with cultivation.

Appling sandy loam is neither an extensive nor an important soil. It occurs in small scattered areas in the southern part of the county, at the head of or bordering intermittent drains, most commonly northwest and southeast of Easley and south of Liberty.

The surface ranges from nearly level to gently sloping toward the drainageways, and both surface and internal drainage are good. Because of its low position and smooth relief, however, internal drainage is slower than that of soils with more sloping relief.

About 50 percent of this land is cultivated, and the rest is in forest or pasture. Cotton, corn, oats, hay, and forage crops, with some sweetpotatoes and vegetables for home use, are the principal crops. These crops are grown in about the same proportion as on Cecil sandy loam and receive similar tillage and fertilization. Cotton yields are 10 to 15 percent lower than on Cecil sandy loam, whereas yields of corn, oats, and hay crops are about the same. Sweetpotatoes yield from 75 to 130 bushels an acre, and vegetables do well.

This soil requires only moderate power for cultural operations and can be worked under a wide range of moisture conditions. Some terracing is necessary on the more sloping areas to control the run-off.

Madison gravelly sandy loam.—Madison gravelly sandy loam differs from Cecil sandy loam in having a browner surface soil with more finer materials and a lighter red and more friable subsoil. The profile is not so well developed as in the Cecil soils, as it has developed from materials high in content of mica. In forested areas there is a covering of partly decomposed leaves and other debris about one-fourth inch thick on the surface. Scattered over the surface are angular fragments of quartz from 1 to 4 inches in diameter and platy fragments of quartz mica schist varying in size and quantity. Also, in places there are slabs of disintegrated quartz mica schist on the surface. The surface soil, to a depth of 4 to 8 inches, is yellowish-brown friable and mellow gravelly sandy loam. This layer is well matted with small roots and contains a small quantity of organic matter, some platy quartz mica schist fragments, and angular quartz gravel. The content of mica flakes in the surface soil is high enough to give the soil a greasy feel and shiny appearance when pressed between the fingers. In cultivated fields the surface soil is brown or yellowish-brown friable and mellow gravelly sandy loam. Between the surface soil and the subsoil there is generally a transitional layer of reddish-brown firm but friable sandy clay loam 2 to 4 inches thick. This also contains some quartz mica schist fragments and an abundance of mica flakes. The subsoil is red or light-red fairly stiff but brittle and friable clay to a depth of 20 to 24 inches, where it grades into lighter red and more friable clay or clay loam. At a depth of 24 to 36 inches the soil rests on soft disintegrated and partly decomposed red, brown, and yellow quartz mica schist rock materials. All layers of the soil are permeable to air and water, and roots readily penetrate the subsoil.

The Madison soils have developed from highly micaceous rock materials, and, because of the slow rate at which this material decomposes, the profiles in places are neither uniformly nor well developed. Many variations are included in mapping. In numerous places the upper subsoil layer of firm brittle clay is lacking, and the surface layer passes directly into friable very micaceous clay loam. In other places the soft, disintegrated, partly decomposed rock material or unweathered quartz mica schist rock is within a few inches of the surface. Dikes or intrusions of rock occur throughout this soil. Some areas mapped as Madison gravelly sandy loam are a shallow phase of this soil. In places where the soil is under cultivation and part of the surface soil has been removed by erosion, the texture is gravelly loam or gravelly sandy clay loam. The Madison and Cecil soils grade into each other, and the boundaries between these soils are established arbitrarily in many places.

Madison gravelly sandy loam is not an extensive soil. It generally occurs in comparatively small areas on hilltops or knolls that are slightly higher than surrounding areas of Cecil soils. This soil is most common west of Pickens and in the vicinities of Six Mile and Catechee in the southwestern part of the county. A few areas border the Saluda River. The surface ranges from undulating and gently sloping to rolling, and both external and internal drainage are good.

Probably 35 percent of the land is cultivated, and the rest is in second- or third-growth forest cover, consisting mainly of white oak, post oak, and shortleaf pine, with some red oak, black oak, dogwood, and hickory.

Those areas of Madison gravelly sandy loam in which the soil is not too shallow over bedrock and in which the gravel content is low are good for the production of cotton, corn, small grains, vegetables, and fruits. In Georgia, Madison gravelly sandy loam is considered one of the best soils in the Piedmont province for the production of cotton. In this county, however, the shallowness of the soil, together with a rather high proportion of gravel and fragments of schist rock on the surface, depreciates its agricultural value.

Cotton, corn, small grains, and hay and forage crops are the principal crops. Probably 50 percent of the cultivated land is devoted to cotton, 30 percent to corn, and the rest to oats, forage crops, garden vegetables, and fruits. Tillage methods and fertilization are essentially the same as for Cecil sandy loam. Cotton yields from 200 to 400 pounds of lint an acre, corn from 10 to 25 bushels, and oats from 15 to 35 bushels. These crops are given a liberal application of a 3-8-3, 4-8-4, or 5-7-5 mixture.

Madison gravelly sandy loam on the same slope and under the same cultural treatment as Cecil sandy loam is not so susceptible to accelerated erosion as in that soil. This is probably due to the fact that the surface soil and the subsoil are porous and absorb a liberal quantity of rainfall and also to the fact that the platy schist fragments on the surface protect the soil to some extent. On the more sloping areas terracing is necessary to control run-off, but this practice should be supplemented by strip cropping. A considerable part of Madison gravelly sandy loam is comparatively shallow over rock. It is important that the soil be held in place, because sheet erosion would greatly depreciate the value of this land.

Worsham sandy loam.—Worsham sandy loam occurs in very small, widely scattered areas over the county, but it is most common in the southern and southeastern parts. Typically, it occupies the heads of small intermittent and indistinct drainageways or borders such drainageways. The relief is nearly level or gently sloping toward the small drains. The land is poorly drained and seepy, containing wet-weather springs. Much of it lies at the base of slopes, where it receives surface water from the higher adjoining areas. Practically none of this land is cultivated, but it is used mainly as pasture. It supports a good growth of tame grasses throughout the drier part of the summer and furnishes excellent grazing, for which purpose it is best suited. Small drained areas are used for the growing of corn or sorgo.

The 4- to 7-inch surface layer consists of light-gray to dark-gray sandy loam, which in places contains a fair quantity of organic matter. The surface soil is underlain by mottled gray, yellow, and brown sandy clay loam or sandy loam to a depth of 12 to 16 inches. The lower subsoil layer is gray or very light gray heavy tough clay mottled with yellow, light brown, and blue. On drying, this material becomes very hard and cracks into more or less square blocks. The subsoil varies in color and in consistence from place to place.

Hayesville sandy loam.—In cultivated fields Hayesville sandy loam consists of gray or yellowish-gray sandy loam to a depth of 5 to 8 inches. In wooded areas a thin covering of partly decomposed leaf-mold lies on the surface and the topmost 1- or 2-inch layer of the surface soil is darker than the lower part, owing to a small content of organic matter. The surface soil is well matted with roots. In most places it is underlain by a 2- to 4-inch layer of reddish-brown or yellowish-red friable loam or sandy clay loam. The subsoil is red or light-red fairly stiff but brittle and friable clay to a depth of 24 to 30 inches, where it grades into yellowish-red or reddish-yellow friable sandy clay loam or clay loam. Both the upper and lower layers of the subsoil are more friable than the corresponding layers in the Cecil soils. The lower subsoil layer in places contains a fairly large quantity of mica flakes and coarse gritty material. At a depth of 36 to 45 inches the subsoil rests on soft disintegrated and partly decomposed mingled red, yellow, and gray gneiss, which in turn rests on bedrock at a varying depth.

Included with this soil are a few areas, too small to show on the map, that have yellowish-brown or brown friable clay loam subsoils.

Hayesville sandy loam occurs in the northern part of the county in small scattered areas, which occur mostly north and northeast of Pumpkintown and southwest of Prices Store. This is neither an extensive soil nor an important one agriculturally.

This soil occupies comparatively smooth areas at the base of slopes or on ridge tops. The land ranges from nearly level to undulating or gently sloping, having a gradient of 2 to about 7 percent. Natural drainage of all the areas of this soil is good owing to their favorable relief and the texture and friability of both the surface soil and the subsoil. About 25 percent of the land is under cultivation, and the rest is forested to oak mixed with shortleaf pine.

Cotton, corn, oats, hay and forage crops, and home vegetables are the main crops. About 50 percent of the cultivated land is devoted to

cotton, 30 percent to corn, and the rest to oats, hay and forage crops, and vegetables.

Because of its proximity to the mountains, this soil is not so well adapted to the production of cotton as are the soils in the southern part of the county. The frost-free season is shorter, and the nights are cooler in the spring and summer. Cotton land receives 150 to 300 pounds of 4-8-4 or 3-8-3 commercial fertilizer and returns 150 to 300 pounds of lint cotton an acre. Yields of corn and other crops are about the same as on Cecil sandy loam when the land is fertilized in the same manner. Often this soil is not fertilized so heavily as the soils in the southern part of the county, because of its geographical location with respect to markets and good roads. It can be handled with the same ease and power as Cecil sandy loam. Owing to the more friable subsoils, it is not quite so susceptible to erosion as Cecil sandy loam, but some terracing is necessary to control surface water on the more sloping areas.

Hayesville loam.—Hayesville loam differs from Hayesville sandy loam in the texture and color of the surface soil and in relief. The 4- to 6-inch surface soil is grayish-brown or yellowish-brown friable light loam. The subsoil is essentially the same as that of Hayesville sandy loam and has the same variations. In some of the fields that have been cultivated for a number of years and have lost a part of the surface soil by erosion, the higher spots appear yellowish red or reddish brown. These spots are not large. Included in mapping are small areas of sandy clay loam or clay loam in which the surface soil has been removed by erosion, leaving the subsoil exposed.

Hayesville loam occurs in the northern part of the county on the smoother areas at the base of the mountains and in the valleys. Although not extensive, it occupies a larger area than the closely associated sandy loam.

The surface ranges from undulating and gently sloping or gently rolling to rolling, the slope ranging from 2 to 12 percent. Both external and internal drainage are good. About 35 percent of the land is devoted to cotton, corn, oats, hay crops, and summer vegetables; the rest is forested with oak, hickory, and dogwood, mixed with shortleaf pine.

The proportionate acreage devoted to the different crops, yields, cultural treatment, and fertilization are about the same as for Hayesville sandy loam. Owing to the relief, more care must be taken to control run-off and prevent sheet erosion than on the sandy loam.

Cecil clay loam.—The 4- to 6-inch surface soil of Cecil clay loam, locally known as red land, in cultivated fields is brown or reddish-brown clay loam. When the soil is wet the redness is intensified. Generally there is enough sand in the surface soil to make it friable and mellow. In wooded areas a covering of partly decomposed leaves and other debris, about one-fourth inch thick, lies on the surface. The surface 1- to 2-inch layer consists of brown friable and porous loam or sandy clay loam containing some organic matter, which is underlain by reddish-brown friable clay loam to a depth of 5 to 7 inches. Both of these surface layers are well matted with small roots. The subsoil is red stiff but brittle clay to a depth of 26 to 34 inches, where it grades into lighter red and more friable clay. In most places this material contains considerable mica and gritty ma-

terial. It rests on red, light-red, yellow, gray, or dark-gray soft disintegrated partly decomposed gneiss and other crystalline rock materials at a depth of 36 to 50 or more inches. The upper part of the subsoil is heavy stiff clay, which breaks into irregular fragments or clods that are easily crushed to a friable, crumbly mass under normal moisture conditions. When wet the subsoil is sticky and plastic. The subsoil is permeable to air and water. Most of the plant roots are in the surface layers and upper part of the subsoil.

Two varieties of Cecil clay loam are mapped. The first, which might be called normal Cecil clay loam, has developed from crystalline rocks containing little quartz. The second is a clay loam soil that has developed from a material containing an abundance of quartz and from which the original sandy surface soil has been partly removed by erosion, exposing the subsoil with a high proportion of clay. Originally this soil was Cecil sandy loam. The former soil has a brown or reddish-brown friable surface soil, whereas the latter has a reddish-brown or red surface soil. The normally developed Cecil clay loam is less acid than the Cecil clay loam formed as a result of erosion and is a better soil for the production of crops. Areas of the normally developed soil are common north, northwest, and west of Pickens; whereas areas of the soil formed as a result of erosion are most common in the southwestern part of the county, especially in the vicinity of Central.

As mapped, Cecil clay loam includes areas influenced by dark-colored minerals from such rocks as hornblende gneiss or similar rock materials. These areas have browner surface soils and darker red subsoils than the soils described in the foregoing paragraphs. In places dark-colored rock is scattered over the surface and in road cuts. These soils grade toward the Lloyd soils but more nearly resemble the Cecil soils in color. Also included with Cecil clay loam are scattered areas of Cecil clay that are too small to show on a small-scale map. The spots represent areas in which erosion has removed the original surface soil and exposed the clay subsoil. Small spots of sandy loam are also included.

Of the soils in this group Cecil clay loam ranks next to Cecil sandy loam, eroded phase, in extent and in importance. It is scattered throughout the piedmont section of the county, the largest areas lying north and northwest of Pickens and in the southwestern part of the county.

The surface is undulating and gently rolling to rolling, the slope ranging from 2 to 12 percent. On the more level areas water remains after heavy rains because the heavy subsoil is slow to absorb it, whereas on the more rolling areas run-off is rapid and erosion is active unless controlled by terraces or strip crops. Internal drainage is fair to good. This soil must be well terraced and properly managed in order to control surface water and consequent erosion. Inherently, Cecil clay loam is one of the strongest soils in the county. It can be built up to a high state of productivity and maintained in this condition by systematic crop rotations and by plowing under barnyard manure and leguminous crops. The character of the soil insures the retention of the plant nutrients supplied by manure and by commercial fertilizer that are not readily assimilated by growing plants. Yields are affected more by droughts and wet spells, however, than

they are on lighter textured soils. This soil requires more power for cultural operations and must be worked under a narrow range of moisture conditions.

Probably about 70 percent of the land is cultivated, 15 percent is in abandoned fields, 5 percent is in pasture, and the rest is in forest. About 50 percent of the cultivated land is devoted to cotton, 20 percent to corn, 25 percent to oats, wheat, rye, and hay crops, and the rest to home gardens and orchard fruits. Average yields of cotton are slightly lower than on Cecil sandy loam and on Cecil sandy loam, eroded phase. Yields vary more from year to year on this soil than on the sandy loam. When the seasons are favorable yields are generally higher, but when the growing season is marked by prolonged droughts or rainy spells they are lower. Yields of oats, wheat, and hay and forage crops are somewhat higher. According to the county agent, practically the same fertilizer mixtures are used on the heavy-textured as on the light-textured soils of the county. Cotton land receives 250 to 400 pounds of 3-8-3, 5-7-5, or 4-8-4 commercial fertilizer at planting time and 75 to 100 pounds of nitrate of soda or sulfate of ammonia as a side dressing, usually applied before cultivation or after chopping. Yields of cotton range from 150 to 475 pounds of lint cotton an acre. Where cotton rust is prevalent, about 50 pounds of potash, in the form of muriate of potash, is applied with the nitrogen as a side dressing if a low-percentage potash fertilizer is used. Cornland receives 100 to 200 pounds of 4-8-4 commercial fertilizer at planting unless the corn follows cotton on land that has been heavily fertilized. Whether fertilized at planting time or not, cornland receives 75 to 100 pounds of nitrate of soda or sulfate of ammonia as a side dressing when the plants are from 2 to 3 feet high, and yields range from 15 to 30 bushels an acre. From 100 to 150 pounds of 4-8-4 commercial fertilizer is commonly applied for oats at planting time, unless they follow cotton in rotation, and 75 to 100 pounds of nitrate of soda is applied as a side dressing in early spring. Oats yield from 20 to 40 bushels an acre.

Wheatland commonly receives 200 to 300 pounds of 4-8-4 or 3-8-3 commercial fertilizer at planting time and usually does not receive a side dressing. The acre yield is 10 to 20 bushels.

As a rule, hay and forage crops are not fertilized and yield from $\frac{3}{4}$ to 2 tons of hay an acre. The same hay and forage crops are commonly grown as on Cecil sandy loam.

Lloyd clay loam.—Lloyd clay loam has developed from a mixture of rock materials consisting of the weathered materials of light-colored gneiss, dark-colored hornblende gneiss, and other dark-colored rock. This soil is intermediate in color and content of gritty material between the Cecil soils and the dark-red nearly quartz-free Davidson soils.

In cultivated fields this soil is characterized by a reddish-brown mellow and friable heavy loam or clay loam surface soil from 4 to 8 inches thick. The surface soil contains some sandy material, and in places small quantities of angular quartz gravel and rock fragments are scattered over the surface. In forested areas a thin layer of partly decomposed leaves and other debris lies on the surface. The uppermost 2 or 3 inches of the surface soil is dark-brown mellow and friable loam that contains some organic matter and is well matted with small roots. The material in this layer has a weak granular structure. The lower part of the surface soil, which continues to a depth of 4 to 8

inches, is reddish-brown fairly stiff but mellow and friable clay loam. This material breaks into irregular fragments that are easily crushed to a friable mass. The subsoil is dark-red stiff but brittle clay containing a noticeable quantity of sharp quartz grains. When disturbed by digging, this layer breaks into irregular fragments or clods, which on further disturbance break into a friable granular mass when the material is not too moist. When wet the subsoil is sticky and plastic. At a depth of 36 to 44 inches this layer grades into lighter red more friable clay that contains more mica flakes and gritty material and, in places, ocherous yellow spots or streaks. At a depth of 45 to 70 inches this material in turn is underlain by mingled red, black, ocherous-yellow, and gray, soft disintegrated partly decomposed rock material. Parent rock consisting of a mixture of acidic and basic rock lies at various depths.

Slight variations occur from place to place in this soil because the parent material comes from different sources. Areas of the lighter colored more sandy soil are somewhat similar in their characteristics to areas of the Cecil soils. Areas of the heavier textured and darker red soil that is practically free from quartz sand closely resemble areas of the Davidson soils. On the breaks near the streams, soft disintegrated rock occurs in places near the surface and a uniform soil profile is not developed.

Included with Lloyd clay loam are a few small areas of fairly well developed Davidson clay loam, which is an important soil in many places in the Piedmont province. Such areas are $2\frac{1}{2}$ miles southwest of Praters School on the State highway and 1 mile southwest of Norris. This soil has developed from dark-colored basic rocks, which have a comparatively high content of lime and a small quantity of silica. The surface soil is dark reddish-brown clay loam, and the subsoil is dark-red or maroon stiff but brittle smooth clay, which extends to a depth of 40 to 60 inches. Below this the material becomes lighter in color, contains mottles of ocherous yellow, and finally passes into the disintegrated partly decomposed basic rock.

Lloyd clay loam covers a small total area. Most of the areas are scattered in the western and central parts of the county south of the mountains. The largest areas are northwest of Pickens near Twelve-mile School and northwest of Liberty.

The land is nearly level, undulating, or gently rolling, the slope ranging from 2 to about 10 percent. External and internal drainage are fairly slow because of the heavy texture of the surface soil and the subsoil. Run-off is not very rapid, except on the more rolling slopes. On the smoothest areas, water remains after heavy rains because the heavy-textured subsoils are slow to absorb the water.

Inherently this soil is a little stronger than Cecil clay loam and is the least acid soil of the county. It is probably the best soil for growing alfalfa, clover, oats, wheat, corn, and grass.

Probably 75 percent of the land is cultivated; the rest is in second-growth white oak, post oak, red oak, black oak, shortleaf pine, hickory, and dogwood. About 60 percent of the cultivated land is devoted to cotton, 20 percent to corn, and the rest to oats, wheat, hay crops, and garden vegetables. About the same fertilizers are used for the different crops as on Cecil clay loam, and yields are practically the same for cotton, although a little higher for oats, wheat, and hay crops. Cotton yields from 200 to 500 pounds of

lint an acre, corn 15 to 35 bushels, oats 20 to 40 bushels, wheat 12 to 20 bushels, and hay and forage crops 1 to 2½ tons.

This soil requires terracing to control the run-off, although it is not quite so susceptible to erosion as Cecil clay loam. Crops can be planted in the spring at about the same time as on Cecil clay loam. This soil requires the same power for cultural operations and has to be worked under the same narrow range of moisture conditions as Cecil clay loam.

Wickham loam.—Small strips of Wickham loam occupy the terraces and the second bottoms bordering the first bottoms of the larger streams. The terraces lie from 10 to 25 feet above the normal stream level and are not subject to overflow except during periods of extremely high water.

The 6- or 8-inch surface soil is brown or dark-brown mellow friable loam having a weak granular structure and a fair content of organic matter. To a depth of 18 to 26 inches the subsoil is reddish-brown fairly stiff but friable clay or clay loam that breaks down readily to a crumbly granular mass. This is underlain by lighter reddish brown or yellowish-red fairly compact but friable clay or clay loam, which contains more gritty material and is more friable than the layer above. Below a depth of 38 or 40 inches the material generally is mottled yellow, red, gray, and brown friable clay loam. In some places a small quantity of rounded gravel is on the surface, and in a few places streaks of rounded gravel occur 4 to 5 feet below the surface.

This soil occupies widely scattered areas. Minor variations occur in the texture and color of both the surface soil and the subsoil and in the depth of the different horizons. A few small areas of Wickham silt loam are included. One of these is near the point where the Saluda River leaves the county. Also included are two areas of Hiwassee loam, one of which is west of Clemson College and the other west of Calhoun near the Seneca River. These soils differ from the Wickham soils in that they lie higher above overflow and have a more rolling relief and redder subsoils, in which water-worn gravel is more noticeable. Both these included soils have developed from the same materials, but the Hiwassee soils have developed from very old alluvial deposits on older terraces high above overflow.

The larger areas are near the larger streams, especially along the Keowee River, and the smaller along Twelvemile, Big Eastatoe, and Wolf Creeks, the Saluda River, and elsewhere. The total acreage is very small.

The relief ranges from nearly level to gently sloping, the slopes in a few places being steeper than 6 percent. Both surface and internal drainage are good.

This soil is productive, easily managed, and well adapted to growing cotton, corn, small grains, and hay and forage crops. The relief is favorable for farming operations. Probably 95 percent of the land is cultivated, mainly to cotton, corn, oats, and hay crops. The different crops are grown in about the same proportions and about the same fertilizers are used as on Cecil clay loam and Lloyd clay loam.

Cotton yields from 200 to 500 pounds an acre (pl. 2), corn 20 to 40 bushels, oats 25 to 35 bushels, and hay and forage 1 to 1½ tons.

Some terracing is necessary on the more sloping areas to control the surface water. Moderate to heavy power is needed for cultural operations, but the soil can be worked under a wider range of moisture conditions than can Cecil and Lloyd clay loams.

Altavista loam.—The surface soil of Altavista loam to a depth of 6 or 8 inches is grayish-brown or brown loam containing a small quantity of organic matter. The subsoil is brownish-yellow silty clay loam to a depth of 18 or 20 inches, where it grades into yellow or light yellowish-brown smooth silty clay loam. At a depth of 32 to 38 inches this material rests on yellowish-gray or mottled red, yellow, and gray clay, sandy clay, or sand and gravel.

Included with this soil are one or two small areas of sandy loam along Big Eastatoe Creek, and in places the surface soil is dark-brown loam. Minor variations in the color and the texture of the subsoils occur from place to place.

Like Wickham loam, this soil occurs in narrow strips on the terraces adjoining the first bottom lands along the larger streams. It lies from 2 to 10 feet above normal stream level and is seldom overflowed. Small bodies are widely scattered along the Keowee River, Big Eastatoe Creek, and other creeks. The total area is very small.

The relief is nearly level or gently sloping, and drainage is fair to good. Because of its low position and smooth relief drainage is rather slow in places.

Altavista loam is a good soil, easily managed, and well adapted to the production of corn, oats, and hay and forage crops. Practically all of this soil is under cultivation and is planted to corn, cotton, oats, and hay and forage crops. Yields of cotton and corn are about 10 to 15 percent lower than on Wickham loam, but yields of the other crops are practically the same.

Congaree fine sandy loam.—Congaree fine sandy loam occurs on the first bottoms along the rivers and large streams. It is an important soil. Fairly large and continuous areas occur along Big Eastatoe, Crow, and Twelvemile Creeks and Keowee, Oolenoy, South Saluda, Middle Saluda, and Saluda Rivers.

The surface soil of Congaree fine sandy loam is grayish-brown or light-brown mellow and friable fine sandy loam 8 to 14 inches thick. It is underlain by brown or yellowish-brown fine sandy loam, loam, or silt loam to a depth of 3 to 4 feet. Below this the material is stratified sand and gravel or mottled silty clay mixed with coarser materials. Both the surface soil and the subsoil contain an abundance of finely divided mica flakes, which give the soil a smooth or slightly greasy feel.

This soil is variable in color, texture, and structure, owing in part to occasional overflows and consequent shifting of the soil materials and in part to the character of the materials from which the soil has developed. In places, especially bordering the streams, a light-colored fine sand or medium sand covers the surface to a depth of a few inches. Other spots have a brown silt loam or loam surface soil underlain by brown silt loam. In places, narrow strips of Altavista loam or sandy loam 25 to 50 feet wide border the uplands and are included with this soil because they are too small to show on the small-scale map.

The surface is nearly level with a gradual slope toward the streams, broken in places by small hummocks and ridges. With the exception of a few slight depressions, surface and internal drainage are fair to good. Most of this soil is subject to occasional flooding.

This is a fertile soil easily cultivated and especially adapted to the production of corn and hay crops. Practically all of the land is cultivated, and about 90 percent is devoted to corn, which is the main crop. Sometimes cowpeas or soybeans are planted with the corn. Forage crops, consisting of cowpeas and sorghum or soybeans and sorghum, are planted on about 5 percent of the soil, and cotton is grown on the rest. Cotton is planted in small strips on the better drained land bordering the uplands along some of the streams in the northern part of the county.

Some farmers apply from 100 to 150 pounds of 3-8-3 or 4-8-4 commercial fertilizer an acre at the time of planting corn and a side dressing of 75 to 100 pounds of nitrate of soda or sulfate of ammonia when the plants are 2 to 3 feet high. Much of the cornland is not fertilized at planting time but receives a side dressing as above. Corn yields from 25 to 45 bushels an acre. Cotton land receives 150 to 300 pounds of 3-8-3 or 4-8-4 commercial fertilizer at planting time and yields 150 to 350 pounds of lint cotton an acre. Ordinarily hay crops are not fertilized. They yield from $\frac{3}{4}$ to $1\frac{1}{2}$ tons an acre. Watermelons do well on this soil, and the quality is excellent.

Flooding is the main problem on this soil, and the farmer can do little to prevent this except to keep the stream beds cleared of logs and brush and prevent material from washing in from adjoining uplands. Artificial drainage is not generally practiced, but scattered small depressions would be benefited by it.

Congaree silt loam.—The surface soil of Congaree silt loam is brown or reddish-brown mellow and friable silt loam from 8 to 16 inches thick. The subsoil of brown heavy silt loam or silty clay loam reaches a depth of 28 to 36 inches, where it grades into mottled brown, bluish-gray, and light-gray silty clay. Usually the lower part of the substratum is saturated with water during the winter, and mottling increases with depth. All layers contain considerable mica, which gives the soil a smooth greasy feel. The content of mica also increases with depth.

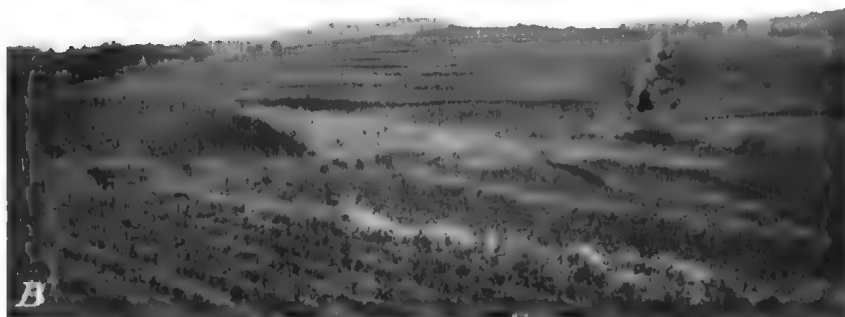
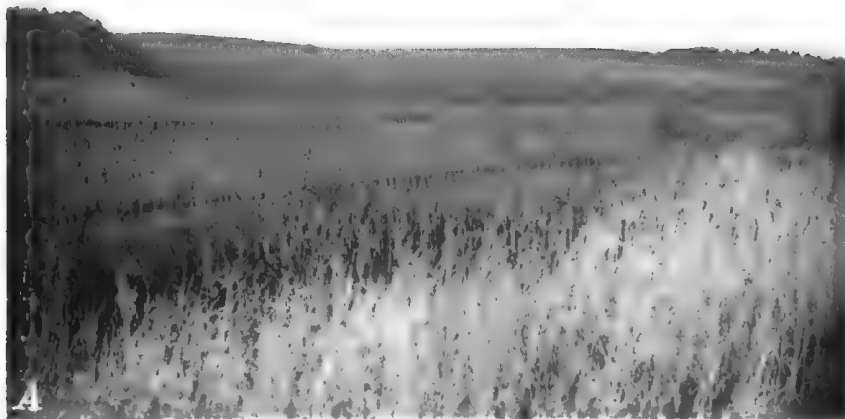
Areas of Congaree silt loam vary in texture, color, and structure. In places a thin covering of sandy loam has washed in from the adjoining upland. In places the subsoil consists of interbedded layers of silt, silt loam, sand, or sandy loam.

Included with this soil are small areas of fine sandy loam too small to show on the small-scale map. Bordering many of the streams are narrow strips from 10 to 15 feet wide consisting of light-gray fine sand or coarse sand to a depth ranging from 1 to 3 feet. In the slight depressions the soil is naturally poorly drained and the surface soil is dark brown. The subsoil becomes mottled with brown and gray at slight depths. Several very narrow strips of Wickham and Altavista loam are included because they are too small to show separately.

Like Congaree fine sandy loam, Congaree silt loam occurs on the first bottoms along the larger streams and is subject to occasional flooding. The relief is the same as that of the fine sandy loam, but drainage is not so rapid and is imperfect in places. Fairly large areas occur along the Oolenoy River, Twelvemile Creek, and Eighteen-



Cotton on Wickham loam.



Characteristic relief of the soils of the hilly uplands: *A*, Ridge terracing and contour cultivation on Cecil sandy loam, eroded hilly phase; *B*, ridge terracing and contour cultivation on Cecil clay loam, hilly phase, in the background.

mile Creek, but the total area of this soil is not so large as that of the fine sandy loam. It is the best soil in the county for the production of corn and hay. Practically all of the land is cultivated, and about 95 percent is devoted to corn. Cowpeas or soybeans are often planted with the corn. The remaining 5 percent is devoted to soybeans or cowpeas with sorghum for hay. Corn is fertilized the same as on Congaree fine sandy loam, and yields range from 30 to 60 bushels an acre. Forage crops yield from $1\frac{1}{2}$ to $2\frac{1}{2}$ tons an acre.

This silt loam requires more power for cultural operations than does the fine sandy loam and cannot be worked so soon after a rain because of its heavier texture and less rapid drainage. Crops cannot be planted so early in the spring as on the fine sandy loam.

In places open drainage ditches are common, and these greatly improve drainage by removing excess surface water.

SOILS OF THE HILLY UPLANDS

Soils of the hilly uplands include Cecil sandy loam, eroded hilly phase; Madison gravelly sandy loam, hilly phase; Cecil clay loam, hilly phase; Lloyd clay loam, hilly phase; Hayesville loam, hilly phase; and Porters loam, smooth phase. With the exception of Porters loam, smooth phase, this group comprises all the hilly phases of the soils in Pickens County. The relief ranges from rolling to hilly (pl. 3, *A* and *B*), and the slope ranges from about 12 to 28 percent. These soils do not cover so large an aggregate acreage as the soils in the preceding group. They occupy about 19 percent of the area of the county. They are well to excessively drained.

The surface soils and subsoils are shallower over bedrock and the profile is less uniform than in the soils in the first group. This is due to the steepness of slope where geological erosion has kept close pace with the disintegration and decomposition of the rocks from which these soils are derived.

Perhaps 35 percent of the total area of these soils is cultivated, and the rest is in forests or abandoned land, most of which is grown over with small pines, briers, and broomsedge. Sheet and gully erosion have been and are now active on these soils. Some of these eroded hillsides would be difficult and expensive to reclaim. They are unsightly, and every farmer or landowner should make some attempt to reclaim them with kudzu or trees. Kudzu is recommended highly for reclamation of these areas and for the prevention of further inroads by erosion. Lespedeza would do well on some of the slopes.

Because of the rolling and hilly relief, farming operations are more difficult and more expensive than on the soils of the smoother uplands, terraces, and well-drained bottom lands. Care must be taken to prevent further erosion. Terraces should be properly constructed and should be close enough together to control run-off from the surface. Terraces alone will not prevent erosion, and they should be supplemented by strip cropping and contour cultivation. Perhaps it is not economical to farm some of these steep hillsides, but, if this is the only land that the farmer owns, it is necessary that he make the best use of it. Improved heavy farm machinery cannot be used advantageously on many of these hillsides. Most of the farmers practice contour tillage (pl. 3, *A* and *B*). About the same crops are grown

on these hilly soils as on the typical soils, but yields usually are less under the same cultural treatment and fertilization.

Cecil sandy loam, eroded hilly phase.—Except in relief, Cecil sandy loam, eroded hilly phase is essentially the same in all respects as Cecil sandy loam, eroded phase. The surface soil varies in texture and in color, and cultivated fields present a spotted appearance in places, as a part or all of the original sandy loam covering has been removed by accelerated erosion. The relative size of the sandy loam areas and sandy clay loam or clay loam areas is about the same as on Cecil sandy loam, eroded phase.

Owing to the hilly relief, the subsoil of this soil is not so well developed in places, but in general it is the same in texture, color, friability, and depth as the subsoil of Cecil sandy loam and Cecil sandy loam, eroded phase.

This is the most extensive soil of the hilly uplands, and a higher proportion of it is cultivated than of any other soil of the group. Comparatively small areas are well distributed over the piedmont section.

The relief ranges from rolling to hilly, and the gradient is from 12 to 28 percent. Some of the slopes, especially where the soil borders the drainageways, are short and choppy, whereas others are fairly long and even. Both surface and subsurface drainage are good, and the surface run-off is rapid unless controlled by terraces.

Probably 30 percent of this land is cultivated, a small percentage is idle or in pasture, and the rest is in second- or third-growth forest consisting of various species of oak, hickory, dogwood, and shortleaf pine. Some of the woodland is used for pasture.

This soil is utilized mainly for the production of cotton, corn, oats, some wheat, and hay crops, and small acreages are devoted to fruits and vegetables. About 50 percent of the cultivated land is devoted to cotton, 30 percent to corn, 10 percent to oats, and the rest to hay and forage crops, summer vegetables, orchard fruits, and other minor crops. About the same fertilizers are used for the different crops as on Cecil sandy loam, eroded phase, but yields average from 10 to 15 percent lower. Management plays an important part on this soil and is reflected in the yields.

Much care must be taken to control the surface water by building and maintaining good terraces. Even with proper terracing, however, serious sheet erosion cannot be prevented under continuous clean cultivation. Strip cropping should be practiced where row crops are grown.

The fields are small, irregular in shape, and hilly. Therefore cultural methods are more difficult and expensive than on smoother land, and tractors and other improved machinery cannot be used to advantage.

The steeper areas of this soil should be in permanent grass cover or in forest.

Madison gravelly sandy loam, hilly phase.—Madison gravelly sandy loam, hilly phase, is essentially the same, except in relief, as Madison gravelly sandy loam described under the first group. The texture, color, and content of gravel in the different layers are essentially the same. In places neither of these soils has a well-developed profile, the hilly phase being the more variable of the two. Numerous slabs of quartz mica schist rock lie on the surface.

This is one of the least extensive soils of the county. Most of the areas are northwest, west, and southwest of Pickens and in the vicinity of Catechee. It is closely associated with Madison gravelly sandy loam. The surface ranges from rolling to hilly, and both surface and subsurface drainage are good. Most of the slopes are short and choppy.

Probably 15 percent of the total area is in cultivation; the rest is in second- or third-growth forest including various species of oak, hickory, and shortleaf pine. Cotton, corn, oats, and hay crops are the principal crops. They are grown in about the same proportion and about the same fertilizers are used as on Madison gravelly sandy loam, but yields average much lower. This soil is more difficult and expensive to handle than typical Madison gravelly sandy loam. Most of it should be seeded to grasses or planted to trees.

Cecil clay loam, hilly phase.—The 2- to 4-inch surface soil of Cecil clay loam, hilly phase, is brown reddish-brown, or red friable clay loam. This is underlain by red stiff brittle clay to a depth of 24 to 30 inches, where the subsoil becomes lighter red and is more friable. Cecil clay loam, hilly phase, is essentially the same as Cecil clay loam except in relief. This hilly soil includes larger areas of clay than are included with Cecil clay loam, also areas in which small gullies are beginning to form because of accelerated erosion. The gullies are not yet deep enough to prevent crossing with farm machinery.

This soil is most common north of Pickens and in the west-central and southwestern parts of the county, but it is distributed throughout the piedmont section. It occurs on rolling or hilly relief, the gradient ranging from about 12 to 28 percent. Some of the slopes are short and choppy, whereas others are fairly long and even. Surface drainage is good to excessive where not controlled by terraces, and subsurface drainage is good. The fields are, for the most part, small and irregular. Cultural operations are more difficult and more care must be exercised to prevent erosion than on the smoother and lighter textured soils.

Probably 50 percent of this soil is cultivated, the rest being abandoned land in second- or third-growth forest. Some of the abandoned land and woodland is used for pasture.

The same crops are grown as on Cecil clay loam, and they receive the same fertilizer treatment. Crop yields average from 5 to 15 percent lower, depending largely on management and distribution of rainfall. The steeper areas should be seeded to grass or planted to trees. Strip cropping and terracing are essential on cultivated areas for effective control of erosion.

Lloyd clay loam, hilly phase.—The hilly phase of Lloyd clay loam differs from Lloyd clay loam only in relief. It has developed from the same kind of material and has essentially the same profile characteristics.

This is one of the less extensive soils of the county. Several small areas are in the vicinity of Twelvemile School, and several are scattered in the west-central part. It occurs in association with Lloyd clay loam on the rolling and hilly areas. Surface drainage is good to excessive if not controlled, and internal drainage is good. The same care must be exercised to control surface water as on Cecil clay loam, hilly phase.

About 20 to 30 percent of this soil is cultivated to the same crops

in about the same proportion as on Lloyd clay loam, but crop yields generally are somewhat lower.

Hayesville loam, hilly phase.—Hayesville loam, hilly phase, is characterized by a grayish-brown or yellowish-brown friable light loam surface soil underlain by a red or light-red stiff but friable clay upper subsoil layer. The lower subsoil is yellowish-red or reddish-yellow friable clay or sandy clay loam. Except in the texture of the surface soil, this soil is essentially the same as Hayesville sandy loam.

The profile is not so well developed in this soil as are the profiles of the smoother Hayesville soils. In places the profile is very shallow, and the surface soil rests on soft, disintegrated, and partly decomposed rock material at a depth of 8 to 12 inches. The surface is rolling to hilly, and, naturally, drainage is good.

Probably 10 percent of the total area is under cultivation to the same crops as are grown on Hayesville sandy loam and Hayesville loam. Crop yields average lower than on the typical soil.

Hayesville loam, hilly phase, occurs in the northern part of the county on the rolling or hilly areas associated with Hayesville sandy loam and Hayesville loam. It is the most extensive of the three soils, but the total area is only moderately large.

Porters loam, smooth phase.—Porters loam, smooth phase, occurs in small scattered areas in the northwestern part of the county. It is associated with the soils of the steep mountains, occupying the comparatively smooth areas in the mountain passes, at the base of slopes, and on the flatter ridge tops. This soil is well adapted to the growing of corn, wheat, oats, cabbage, potatoes, and other vegetables, to grazing, and to orcharding. Less than 10 percent of the land is cultivated, mainly to corn and summer vegetables. Inherently it is a good soil, the unfavorable factors being the hilly or steeply sloping relief and geographical position.

The surface soil is brown or dark-brown mellow and friable loam 8 to 14 inches thick and contains some well-decomposed organic matter. The subsoil is yellowish-brown or reddish-brown friable and porous heavy loam or clay loam that commonly rests on disintegrated and partly decomposed gneiss or bedrock consisting mainly of gneiss at a depth of 24 to 36 inches. In places a few rock fragments are scattered over the surface and embedded in the soil mass. In wooded areas this soil has a thin layer of partly decomposed leafmold $\frac{1}{2}$ or 1 inch thick.

The surface ranges from gently rolling and rolling to hilly, with a slope of 8 to 28 percent. Both the surface soil and the subsoil are porous and permeable to air and water; hence this soil does not erode so easily as the level soils in the piedmont section. Both external and internal drainage are good.

SOILS OF THE STEEP AND MOUNTAINOUS AREAS

Soils of the steep and mountainous areas include Hayesville-Madison loams, steep phases; Hayesville loam, steep phase; Porters loam; and Porters fine sandy loam. These soil types and phases have the most rugged relief of any soils in the county. They occur in the mountainous section, and on the steep and rough areas within the Piedmont province. Here they occupy steep sides of the high knobs or narrow ridges, which have a slope of 25 to 80 percent.

There are some precipitous bluffs. Drainage is good to excessive.

Owing to the steep relief these soils have not formed uniformly deep profiles. In many places the soft disintegrated or solid bedrock lies near the surface and outcrops are common. The underlying rocks are principally granite and gneiss, although there are small areas of dark-colored basic rocks.

Practically none of these soils are cultivated. They are inherently good soils, but the steep relief precludes their use for general farming. Small areas here and there at the base of the slopes and in the coves are and can be used for the production of garden vegetables, especially cabbage and potatoes, and some areas could be utilized for the growing of apples. Pasture grasses could be grown, particularly on some of the Porters soils. In North Carolina and southwestern Virginia good pastures are obtained on the Porters soils and to a less extent on the Hayesville soils where the relief is not too steep. Wildlife reservations and recreation grounds could be established successfully. In the mountainous part the summers are cool, and there are ideal locations for summer resorts.

Hayesville-Madison loams, steep phases.—The steep phases of Hayesville-Madison loams represent a complex of the Hayesville and Madison soils and a few areas of the Lloyd soils having a slope steeper than 28 percent. This complex is fairly extensive in the piedmont section, where it occupies narrow strips bordering the streams and narrow ridges or small knobs. The largest and most numerous areas are in the west-central and southwestern parts of the county and northeast of Pickens. In places the slopes are very steep and are broken by small drains. Naturally, drainage is good and surface run-off is fairly rapid.

Probably 90 percent of this soil has the same profile characteristics as the Hayesville soils; the other 10 percent has the characteristics of the Madison or Lloyd soils. The texture of the surface soil ranges from sandy loam or loam on top of the ridges to sandy clay loam or clay loam on the slopes. Very little organic debris has accumulated on the surface except at the base of some of the slopes. Owing to the steep relief, the profiles are not well developed in places; consequently they are variable in color and in depth to bedrock. In general, however, the subsoils are red stiff clays in the upper part and lighter red and more friable clays or clay loams in the lower part.

A few loose stones are scattered over the surface in places. Some of these are shown by stone symbols on the soil map; for instance, near Keowee School in the west-central part of the county.

Practically all of this land is in second-growth forest consisting of white oak, post oak, red oak, black oak, and shortleaf pine, with some hickory, dogwood, and tuliptree (yellow poplar). Some of this land is used as range land for cattle, and it furnishes some grazing.

Hayesville loam, steep phase.—The steep phase of Hayesville loam occurs on the southern slopes of the steep mountains in the northwestern part of the county, on the lower ridges or spurs that extend into the piedmont section, and on the outlying knobs in the Piedmont province. It occurs at lower elevation than the Porters soils, but the slopes are steep to mountainous and broken by intermittent drainageways.

This is the most variable member of the Hayesville series. The

surface soil varies in texture from sandy loam in places on the ridges to loam or clay loam on the slopes. There is very little accumulation of partly decomposed organic matter on the surface except at the base of some slopes. Owing to its steep relief, the subsoil is more variable in color and in depth than are the subsoils of the smoother Hayesville soils. In places the red stiff but friable subsoil is not developed and the surface soil passes into soft disintegrated and partly decomposed rock material. Loose surface stone is common on some of the areas of this soil and are shown by stone symbols on the soil map.

Included with Hayesville loam, steep phase, are a few small areas of Rabun loam or Rabun clay loam. One such area is about 1 mile southeast of Cane Creek School and another about 1 mile southeast of Alexanders Store on United States Highway No. 178. These areas resemble the Davidson and the Lloyd soils in color, but in most places the soil is shallow over rock and not well formed. Disintegrated or solid basic rock fragments occur on or near the surface.

This soil is covered by forest consisting mainly of white, post, red, black, pin, and chestnut oaks, tuliptree, hickory, dogwood, shortleaf pine, and pitch pine, together with an undergrowth of rhododendron, mountain-laurel, and other shrubs and herbs. There is a small amount of merchantable oak and pine timber. Some of this land is used as range land for cattle, and it furnishes some grazing.

Porters loam.—The surface soil of Porters loam is brown or dark-brown mellow and friable loam 8 to 14 inches thick. This material generally contains a fair quantity of decomposed organic matter. The layer of partly decomposed leafmold on the surface is $\frac{1}{2}$ to 1 inch thick. The subsoil is yellowish-brown or reddish-brown friable and porous sandy clay loam or clay loam, which rests, at a depth of 24 to 36 inches, on disintegrated and partly decomposed gneiss rock. The lower part of the subsoil generally contains more gritty material and is more friable than the upper part. All layers are friable and porous and permeable to air and water. Roots have no difficulty in penetrating the soil. Included with this soil are small scattered areas with light-brown or grayish-brown surface soils, and in places the subsoils may be light-red or yellowish-red friable clay loam.

Porters loam is a typical soil of the mountains. It occurs in fairly large areas in the north-central and northwestern parts of the county. The relief ranges from steep to mountainous, the slopes, ranging from about 30 to 80 percent; and drainage is good.

All this soil is in forest consisting of white, post, red, black, and chestnut oaks; hickory, and pine on the interstream areas, with tulip-tree, beech, birch, and hemlock bordering the streams. The undergrowth consists mainly of rhododendron and mountain-laurel. Some of this soil is used for grazing. The best timber in the county is on Porters loam, but it is scattered and some of it is difficult to reach.

Porters loam is inherently a good soil but steepness of relief precludes its use for farming purposes. Some of the less steep areas could be used for the growing of pasture grasses or for the production of apples. In many places in North Carolina and southwestern Virginia good pasture grasses are obtained on Porters loam. Small spots at the base of the slopes and in coves could be used for the production of garden vegetables, cabbage, and potatoes. Under present economic conditions, however, most of the Porters loam should remain in forest.

Porters fine sandy loam.—Porters fine sandy loam is grayish-brown or yellowish-brown mellow and friable fine sandy loam or light loam to a depth of 5 to 8 inches. The upper part of the surface soil is slightly darker than the lower part, owing to a higher content of organic matter. There is a thin covering of leafmold on the surface. The subsoil is friable yellowish-brown or light reddish-brown loam or clay loam varying in depth. At a depth of 20 to 36 inches the subsoil rests on disintegrated and partly decomposed gneiss rock.

This soil includes many variations in texture and in color of both the surface soil and the subsoil. The texture of the surface soil ranges from light-gray fine sandy loam to medium sandy loam on some of the ridge tops to brown light loam near the base of slopes or in protected coves. In spots the subsoil is light-red or yellowish-red friable clay loam, and in other places it is brown highly micaceous friable loam. On the crest of some of the ridges no soil has developed and the material consists of soft partly decomposed gneiss and other crystalline rock. The relief ranges from steep to mountainous, and drainage is good.

Included with Porters fine sandy loam near Table Rock are a few small areas of Ashe fine sandy loam. Here the surface soil is grayish-brown loam, and the subsoil is brownish-yellow clay loam.

Porters fine sandy loam is associated with Porters loam in the north-central and northwestern parts of the county. These two soils occupy the steepest slopes in the county. Like the loam, Porters fine sandy loam is forested, mainly with white, post, red, black, and chestnut oaks, together with shortleaf pine and pitch pine. The undergrowth is mainly rhododendron and mountain-laurel. The land supports some good timber, which, however, is scattered and in places hard to reach.

MISCELLANEOUS SOILS AND LAND TYPES

Alluvial soils (Congaree soil material), rough gullied land (Cecil soil material), rough stony land (Porters and Hayesville soil materials), and rock outcrop are classed as miscellaneous soils and land types. Because of its smooth surface and favorable moisture conditions, alluvial soils (Congaree soil material) is well suited for pasture and if properly drained, some of it can be farmed. Rough gullied land (Cecil soil material) in its present condition is almost beyond economical reclamation. By growing kudzu or planting trees, however, and by the construction of some brush or earth dams across the gullies, these unsightly areas may be reclaimed. Rough stony land (Porters and Hayesville soil materials) ranges in relief from steep to mountainous, having a slope of 20 to 90 percent. This unfavorable relief, together with the presence of outcrops of solid rock and numerous large boulders, precludes the use of this land for farming or even for grazing. Trees do not do so well as on Porters loam, because the soil is shallow and moisture conditions are not favorable. Rock outcrop is strictly nonagricultural. Most of the rough stony land and rock outcrop occur in the northwestern part of the county.

Alluvial soils (Congaree soil material).—Alluvial soils (Congaree soil material) occur in the first bottoms along the streams throughout the county, in association with Congaree fine sandy loam and Congaree silt loam. The areas range in width from 100 to 800 feet. The soil materials are so variable in texture, color, and structure that they cannot be classified as definite soil types. These materials have not developed into a definite soil because of recent deposition, poor drain-

age, and constant removal or deposition of additional material. In many places the soil is saturated part of the year and is subject to frequent overflows. The land is nearly level, with a few small hummocks or very low ridges, but in most places it is only a few feet above the normal stream level. Very little attempt is made to cultivate the land, owing to the hazard of flooding and poor drainage.

Probably 5 to 10 percent of the total acreage is cultivated to corn; and a few small areas of the lighter sandy land are devoted to cotton. The land planted to corn constitutes the better drained areas. It is fertilized in about the same manner as Congaree fine sandy loam and returns about the same or slightly lower yields. About 40 percent of the land is used for summer pasture, and the rest is idle or supports a cover of red gum, sycamore, beech, birch, alder, briers, and some coarse grasses. Where the soil is not too sandy or wet, grasses, once established, afford good summer pasture, owing to abundant moisture and the inherent high fertility of the soil.

Some of this land could be reclaimed and made productive for corn and hay crops by controlling run-off water from the adjoining uplands and by deepening and straightening the present stream channels.

Rough gullied land (Cecil soil material).—This land represents a soil condition brought about by excessive surface gullyng (pl. 4). The surface ranges from gently sloping to rolling or hilly. These eroded areas are the result of either poor management or improper terracing or of both. Practically all of the land has been cleared and farmed at one time but is now abandoned. Most of the surface soil has been removed and in places part of the subsoil and as a result, V-shaped gullies have formed or are forming. The gullies range from 1 to 5 feet in depth. In places between the gullies where the surface soil and the subsoil remain, the texture, color, and structure of the different horizons are similar to those of corresponding layers of typical Cecil clay loam. A few small areas of severely eroded Hayesville and Llovd soils are included.

This soil condition is not an extensive one in Pickens County, and the areas are widely scattered over the piedmont section. They generally occur at the head of small intermittent streams or border them. A small part of the land supports a scant grass cover and is used for pasture. Most of it is practically free from any vegetation. A small part is reforesting itself to shortleaf pine and scrubby oak.

The only way to reclaim these areas is to construct dams of stone, earth, or brush across the gullies, plant young forest trees or hardy grasses and legumes, and terrace the surrounding areas to control surface water. In this way these severely eroded lands would in time afford fair pasture or produce a crop of timber.

Rough stony land (Porters and Hayesville soil materials).—Rough stony land (Porters and Hayesville soil materials) includes areas having steep to mountainous relief and many outcrops of solid rock and large boulders. The land is too steep and too stony for either cropping or grazing but between the rocks and boulders supports a forest growth of white oak, black oak, red oak, chestnut oak, pitch pine, shortleaf pine, tuliptree, and hemlock. These rough stony areas are confined largely to the mountainous section, and some are fairly large.

Rock outcrop.—Rock outcrop includes exposures of bare rock. In the northwestern part of the county there are several exposures of bare



Rough gullied land (Cecil soil material) on an unprotected 20-percent slope.

rock large enough to delineate on the map. Also, there are small outcrops north and southwest of Liberty, northeast of Pickens, and northeast of Ariail.

PRODUCTIVITY RATINGS

The soils of Pickens County are rated in table 6 according to their productivity for the more important crops grown in the county. The different types, phases, complexes, and land types are listed approximately in the order of their general productivity under the better farming practices. These practices include rotating crops, terracing for erosion control, growing legumes, and repeatedly using soil amendments in the form of commercial fertilizers. Most of the fertilizer is applied to cotton. Quantities vary somewhat according to soil type and the preference of the individual farmer. The types of fertilizers and rates of applying them are discussed under the descriptions of the individual soil types.

The ratings compare the productivity of the soils for each crop to a standard of 100. This standard index represents the approximate average acre yield obtained without the use of amendments on the more extensive and better soil types of regions of the United States in which the crop is most widely grown. An index of 50 indicates that the soil is about half as productive for the specified crop as is the soil with the standard index. The standard yield for each crop shown in table 6 is given at the head of the respective columns. Soils given amendments, such as lime and commercial fertilizers, or special practices, such as irrigation, and unusually productive soils of small extent may have productivity indexes of more than 100 for some crops.

The indexes were determined primarily from estimates of the average production of each crop over a period of years under the better management practices. Estimates of yields were made as a result of interviews with farmers, county agents, and others experienced in the agriculture of Pickens County. It is realized that these estimates may not apply directly to specific tracts of land for any particular year, as the soils, as shown on the map, vary somewhat; management practices, as defined, differ slightly; and climatic conditions fluctuate from year to year. On the other hand, the estimates appear to be as accurate information as is available without further detailed and lengthy investigations, and they serve to determine the relative productivity of the soils shown on the map.

The principal factors affecting the productivity of land are climate; soil, including its many physical, chemical, and biological characteristics; slope; drainage; and management, including the use of amendments. No one of these factors operates separately from the others, although one may dominate. In fact, the factors listed may be grouped simply as the soil factor and the management factor, since slope, drainage, and most of the aspects of climate may be considered as characteristics of a soil type in that the soil type occupies specific geographic areas characterized by range of slope and climatic conditions. Crop yields over a long period of years furnish the best available summation of associated factors and therefore are used when available.

The soils are listed in table 6 in the order of their general productivity under the farming practices described. The general pro-

TABLE 6.—*Productivity ratings for the soils in Pickens County, S. C., under better treatment.*

Soil (soil types, phases, complexes, and land types) ¹	Crop productivity index : for—								General productivity		General grouping. (See text)	Principal type of crops, or General farming
	Cotton 400 lbs. 100 = 1	Corn bu. 100 = 50	Oats bu. 100 = 50	Wheat bu. 100 = 25	Hay crops ²	Sweet potatoes 100 = 150 bu. ³	Vegetables ⁴	Pasture ⁵	Grade ⁶	Group ⁷		
Wickham loam.....	90	70	50	50	90	55	Good	85	2	High	First group: Soils with the most favorable relief and drainage and best for crops.	Cotton, corn, grains, hay crops, General farming
Lloyd clay loam ⁸	90	50	70	80	90	---	do.	80				do.
Congaree silt loam.....	---	90	50	---	100	---	Fair	100				Corn with amount of hay General farming
Congaree fine sandy loam.....	70	80	50	---	85	---	do.	90				do.
Cecil sandy loam.....	90	40	40	40	60	85	Good	50				do.
Cecil clay loam ⁹	85	35	60	70	70	---	Fair	70	3	Medium		Cotton, corn, grains, hay crops, General farming
Cecil sandy loam, eroded phase.....	85	40	40	50	60	80	Good	50				do.
Altavista loam.....	70	60	50	50	80	---	Fair	80				do.
Appling sandy loam.....	80	40	40	40	55	85	Good	60				do.
Madison gravelly sandy loam.....	75	35	45	40	55	70	do.	45				do.
Hayesville loam.....	60	40	40	40	55	80	do.	50	5			General farming, forestry.
Hayesville sandy loam.....	60	40	40	40	55	80	do.	50				do.

ductivity grade numbers shown in the column General productivity, Grade,⁷ are based on the weighted average of the indexes for the various crops, the weighting depending on the relative acreage and value of the crop. If the weighted average is between 90 and 100, the soil type is given a grade of 1; if it is between 80 and 90, a grade of 2 is given; and so on. Since it is difficult to measure mathematically either the exact significance of a crop in the agriculture of an area or the importance or suitability of certain soils for particular crops, perhaps too much significance may be given to the order in which the soils are listed. The arrangement does, however, give information as to general productivity. The column General productivity, Group, brings out in general descriptive terms the relative productivity of groups of soils in Pickens County.

The productivity tables do not present the relative roles that soil types, because of their extent and the pattern of their distribution, play in the agriculture of the county. They cannot picture the total quantitative production of crops by soil areas without knowledge of the acreage of individual soil types devoted to each crop.

Economic considerations played no part in determining the crop productivity indexes. The indexes, therefore, cannot be interpreted as indicative of land values except in a very general way. Distance to market, relative prices of farm products, and other factors influence the value of land. Productivity, as measured by yields, is not the only consideration that determines the relative worth of a soil for growing crops. The ease or difficulty of tillage and the ease or difficulty with which productivity is maintained are examples of considerations other than productivity that influence the general desirability of a soil for agricultural use. In turn, steepness of slope, presence or absence of stone, the resistance to tillage offered by the soil because of its consistence or structure, and the size and shape of areas are characteristics that influence the relative ease with which soils can be tilled. Likewise, inherent fertility and susceptibility to erosion are characteristics that influence the ease of maintaining soil productivity. Productivity, as measured by yields, is influenced to some extent by all these and other factors, such as the moisture-holding capacity of the soil and the permeability of the soil to roots and water. They are, therefore, not factors to be considered entirely separately from productivity; but, on the other hand, schemes of land classification to designate the relative suitability of land for agricultural use must give some recognition to them.

In the column General Grouping the relationship between the soil groups described in the text and the general productivity groups are brought out. It may be noted that the first group, which is the group best suited for crops, includes all of the highly productive soils, together with some of the medium-productive ones. The slope of the land is an influential factor in determining whether a soil belongs to the medium-productive or to the better group of soils from the point of view of its use for crops.

⁷ Since cotton and corn are the principal crops in Pickens County, the indexes for these crops are weighted most heavily. Crop indexes are weighted as follows: (a) Soils with the greatest proportionate acreage of cropland in cotton—cotton, 60; corn, 25; oats, 5; hay, 10; (b) soils with slightly lower proportionate acreage in cotton—cotton, 50; corn, 30; oats, 10; and hay, 10; and (c) soils principally used for corn—cotton, 10; corn, 75; oats, 5; hay, 10.

Adjustments of these weightings were made in a few instances. For example, Porters loam, smooth phase, was weighted separately because of its productivity for cabbage and sweetpotatoes.

The two right-hand columns are added for purposes of general information regarding principal crops, land use, type of farming, and general practices of management.

LAND USES AND MANAGEMENT

Under present economic conditions many farmers are using their soils to the best advantage, especially where the one-cash-crop system prevails. In recent years more diversification of crops has been practiced. The acreage of land devoted to the growing of forage crops, such as cowpeas, soybeans, lespedeza, and to less extent kudzu, has increased greatly, and the soils have been improved. The soils and climate of Pickens County favor the production of cotton, as it is less subject to boll weevil infestation than many other areas otherwise well suited to cotton. This is due, perhaps, to the fact that the rainfall is relatively low in July and August and the soil temperature relatively high. Cotton, corn, and to a less extent wheat, rye, oats, and forage crops are grown throughout the piedmont section. The well-drained soils of the first bottoms are the best in the county for the production of corn. On the basis of acreage yields Pickens County rates as one of the best counties in the State for the production of cotton. According to figures from the Bureau of Agricultural Economics, in 1937 the yield of cotton was 430 pounds of lint an acre. This was not only the highest yield in that year but probably the highest ever reported by any county in South Carolina.

All the soils, with the exception of those in the first bottoms and in the mountains, are deficient in organic matter. This is because the soils have developed under a forest vegetation which is unfavorable for the accumulation of large quantities of organic matter, and also under warm temperate conditions and heavy rainfall, which induce rapid leaching of organic matter from the soil. Organic matter in the virgin soils disappears after a few years of clean cultivation. Some farmers have improved the productive capacity of their soils by growing and turning under winter cover crops, such as Austrian Winter peas, rye, and oats, and summer legumes, such as cowpeas, soybeans, vetch, and clover. Only small quantities of barnyard manure are available, as only a few cattle are kept on the farms. Some of the farmers cut the leguminous crops for hay and turn under the stubble for soil improvement. Sometimes the seed is harvested, and the plants are incorporated in the soil. This greatly improves many of the soils of the uplands.

This practice of planting and turning under winter cover crops and leguminous crops while adding organic matter and nitrogen to the soil also protects it from much leaching and erosion. Soil leaching is an important factor in the depletion of plant nutrients. Incorporation of organic matter also greatly improves the physical condition of the soil thereby enabling it to absorb and to retain more moisture. Deep plowing is especially beneficial on the heavy-textured soils, such as Cecil clay loam, as it enables the soil to absorb and to retain moisture, reduces surface washing and erosion, and loosens the soil so that roots may penetrate the subsoil more readily.

Practically all the cultivated upland soils of the county are terraced with terraces of the ridge type, and cultivated on the contour. According to the county agent, Pickens County was known as the

best terraced county in South Carolina at one time. Many of the terraces, however, were not laid out on the proper gradient, were not well spaced, and were not well kept. Considerable hilly land, which should not have been cleared, has been cleared, terraced, and cultivated. Under the practice of continuous clean cultivation, erosion has been active, even on some of the undulating and gently rolling land. Yet the proportion of severely eroded and gullied land in this county is small as compared with the land of some of the other piedmont counties with smoother relief. In places all the original surface soil has been washed off and small gullies are forming, and in small scattered areas erosion has advanced to such a stage as to make the soil unfit for cultivation.

Some of the cultivated hilly land never should have been cleared and cultivated to such crops as cotton and corn. Because of the unfavorable relief and the susceptibility to erosion the soil cannot be held in place under clean cultivation, even with proper terracing. The life of these soils may be prolonged and a part of the land used for clean-cultivated crops if it is properly terraced and strip cropped to control surface water.

Strip cropping in order to control erosion consists of seeding narrow bands or strips to close-growing or thick-growing crops, such as small grains, grasses, and hay crops, with strips of clean-cultivated crops between. The strips should be laid out as nearly as possible on the contour. The close-growing crops check the flow of water and tend to hold the soil particles as the water flows down a slope freshly plowed for cotton or corn. Lespedeza, sorghum with cowpeas, or soybeans, small grains, clovers, and vetch are thick-growing crops adapted to the piedmont section of South Carolina. Strip cropping should be practiced not only on the hilly land but also on some of the gently rolling and rolling slopes. In other words, it should be practiced on slopes having a gradient of 10 percent or more.

No attempt has been made to cultivate the steep and mountainous land. It is devoted mainly to forestry, and a small area is utilized for grazing. Very little care is taken to prevent and to control forest fires, and consequently many acres of forest land are burned over annually. In many places the forests could be greatly improved by thinning and cleaning out the undergrowth of brush and briars.

The soils are capable of being built up and maintained in a fairly productive state if proper rotation of crops and effective methods for the control of erosion are practiced. Very few farmers adhere strictly to a definite crop rotation. The county agent states that the most common rotations practiced, but not strictly adhered to, are 3-year rotations, such as (1) first year, small grains; second year, corn with cowpeas or soybeans; third year, cotton; or (2) cotton 2 years in succession, followed by corn or small grains the third year.

The South Carolina Agricultural Experiment Station recommends the following rotations for the soils of the piedmont section: (1) First year, cotton followed by small grain; second year, small grain with lespedeza; (2) first year, cotton followed by a cover crop of vetch, Austrian Winter peas, or rye, or a combination of two of them; second year, corn with cowpeas or soybeans; (3) first year, cotton followed by a cover crop of vetch, Austrian Winter peas, rye, or a combination; second year, cotton followed by small grain;

third year, small grain with lespedeza or small grain, followed by cowpeas or soybeans; and (4) first year, cotton followed by small grain; second year, small grain with lespedeza; third year, corn with cowpeas or soybeans.

The following rotations are recommended for the first-bottom soils: (1) First year, corn with cowpeas or soybeans; second year, small grain with lespedeza; third year, lespedeza; and (2) first year, corn with cowpeas or soybeans; second year, small grain followed by cowpeas or soybeans.

The soils of Pickens County are well suited to the growing of grasses and hay crops, and the mild climate is suitable for raising work animals, dairy cattle, beef cattle, and sheep. The strongly rolling and hilly lands, together with some of the worn-out and eroded undulating and gently rolling lands could therefore be more profitably devoted to permanent pasture grasses and hay crops for work animals and cattle than to cotton and corn. In this way the rolling and hilly lands could be protected from serious erosion, and the worn-out and eroded lands could be reclaimed and restored to a condition that would make them contribute to the well-being of the community. Although all farms have work animals and a few dairy cattle, very few farmers have considered permanent pasture as a regular crop. A small percentage of the farms have small areas in permanent Bermuda grass pasture. Areas devoted to pasture, however, are for the most part uplands that have become unprofitable to cultivate, woodlands, small areas of Worsham sandy loam, and alluvial soils (Congaree soil material). On most of this land the stand of grass is sparse and the quality is inferior. Animals are often required to walk long distances to feed on small quantities of forage.

The following bulletins give much information on permanent pasture grasses for South Carolina and their adaptations, care, and fertilization requirements:

South Carolina Agricultural Experiment Station Bulletin 308, Permanent Pasture Studies.

Clemson Agricultural College of South Carolina Extension Service Bulletin 99, Permanent Pastures for South Carolina.

Table 7 gives the results of pH determinations of several soils from this county.

TABLE 7.—pH determinations of four soils of Pickens County, S. C.¹

Soil type and sample No.	Depth	pH	Soil type and sample No.	Depth	pH
Appling sandy loam:	<i>Inches</i>		Cecil clay loam:	<i>Inches</i>	
244301.....	0 - ½	5.4	244324.....	¾ - 0	4.3
244302.....	½ - 6	4.8	244325.....	0 - 2	4.7
244303.....	6 - 12	4.9	244326.....	2 - 6	4.7
244304.....	12 - 18	4.9	244327.....	6 - 30	4.6
244305.....	18 - 39	4.9	244328.....	30 - 38	5.0
244306.....	39+	4.0	244329.....	38 - 54+	5.2
Lloyd clay loam:			Hayesville loam:		
244336.....	¾ - 0	5.4	244330.....	½ - 0	4.1
244337.....	0 - 2½	5.1	244331.....	0 - 5	4.4
244338.....	2½ - 9	5.1	244332.....	5 - 7½	4.4
244339.....	9 - 44	5.0	244333.....	7½ - 26	4.6
244340.....	44 - 59	4.8	244334.....	26 - 39	4.7
			244335.....	39 - 52+	4.6

¹ Determinations made by E. H. Bailey, assistant soil technologist, Division of Soil Survey, Bureau of Plant Industry, by the hydrogen-electrode method.

Practically all the soils of the county are acid in reaction, ranging from highly to moderately acid. Neutral or nonacid fertilizers are used generally, but lime is not used to a great extent. The neutral or nonacid fertilizers contain enough dolomitic limestone, which is substituted for sand or other inert materials used as a filler to neutralize the equivalent acidity of mixed fertilizers. H. P. Cooper, director of the South Carolina Agricultural Experiment Station, states that when the pH value of land planted to cotton, corn, oats, cowpeas, and soybeans is 5.0 or less, the soil should respond to an application of 1,000 to 2,000 pounds of limestone or 500 to 1,000 pounds of basic slag an acre. More information on liming recommendations can be obtained from the South Carolina Agricultural Experiment Station Special Circular 1.⁸

Fertilizer mixtures used for the same crops on the different soil types are essentially the same, because the fields are small and irregular and the different series, types, and phases are closely associated. Many fields contain two or more soils. The county agent and the South Carolina Agricultural Experiment Station do not attempt to make any specific fertilizer recommendations for the same crop on the different soil types.

The fertilizer generally used for cotton is a 4-8-4, 3-8-3, or 5-7-5 mixture in applications ranging from 250 to 500 pounds an acre and from 75 to 100 pounds of nitrate of soda or ammonium sulfate applied as a side dressing.

Cornland and small-grain fields are usually fertilized at planting time with 100 to 300 pounds of a 4-8-4 mixture, unless the crops follow cotton in a rotation, when they generally receive no fertilizer at planting time but about 100 pounds of nitrate of soda or sulfate of ammonia as a side dressing. Hay and forage crops, as a rule, are not fertilized.

The South Carolina Extension Service advocates the home mixing of fertilizers. Some of the advantages listed in Clemson Agricultural College Extension Service Circular 126,⁹ are as follows:

(1) A more thorough study and knowledge of fertilizers and soils and the proper adaptation of fertilizers to varied plants and soil conditions, so that a greater productive value is obtained for the money spent; (2) an actual cash saving may be made in purchase price; (3) the sources and amounts of the various materials used are known to farmers; (4) it is a simple operation that can be done thoroughly and efficiently by farm labor with ordinary farm tools; and (5) experiments show that it is as efficient or more efficient in crop production than ready-mixed fertilizer of the same analysis and amount.

Table 8 gives the general fertilizer applications recommended for the principal crops on the principal soils of the uplands of Pickens County by H. P. Cooper, Director of the South Carolina Agricultural Experiment Station.

Sweetpotatoes are not usually grown on Cecil clay loam or Lloyd clay loam. They make their best yields on the light-colored sandy surface soils with an application of barnyard manure and in addition a liberal application of the fertilizers shown in table 8. The Congaree soils in many instances receive no fertilizer, but when they are fer-

⁸ COOPER, H. P. LIMING AND FERTILIZER RECOMMENDATIONS FOR CERTAIN CROPS UNDER VARIOUS SOIL CONDITIONS IN SOUTH CAROLINA. S. C. Agr. Expt. Sta. Spec. Cir. 1, 9 pp. 1934. [Mimeographed.]

⁹ HAMILTON, H. W. HOME-MIXING OF FERTILIZER. Clemson Agr. Col. S. C. Ext. Serv. Cir. 126, 16 pp. 1933.

TABLE 8.—Fertilizer applications recommended for the principal crops on the principal soils¹ of the uplands

Crop	Applica- tion per acre	Composition			Side dressing
		Nitro- gen	Phos- phoric acid	Potash	
Cotton.....	Pounds 500-600	Percent 4-6	Percent 8-10	Percent 4-10	100 pounds sodium nitrate, ammonium sulfate, or Cal-Nitro.
Corn.....	200-300	0-4	8-10	0-4	100 to 200 pounds sodium nitrate, ammonium sulfate, or Cal-Nitro.
Small grain.....	200-400	0-4	8-10	4	Do.
Legumes.....	200-400	0	8-16	0-8	None.
Sweetpotatoes.....	600-1,000	3	8	8	Do.

¹ Cecil, Madison, Hayesville, Lloyd, and Appling soils.

tilized a smaller quantity is applied than on the sandy upland soils. Some experiments indicate that the yields of corn on Congaree sandy loam are not materially increased by a heavy application of potash. Nitrogen and a liberal amount of phosphoric acid and a small amount of potash give the best corn returns on this soil.

The South Carolina Agricultural Experiment Station recommends the following crop varieties for the soils of the piedmont section: Cotton—Coker Farm Relief, Coker 100, Cleve wilt, Dixie Triumph, and Cleveland Big Boll; corn—Douthit Prolific, Mosby Prolific, and Ellis; oats—Coker's Fulgrain, Fulghum, and Appler; wheat—Redhart and Bluestem; barley—Tennessee Beardless No. 5, Bearded Winter, and Clemson Awnless; rye—Abruzzi; soybeans—Otootan, Mammoth Yellow, Biloxi, and Laredo; and cowpeas—Whippoorwill, Victor, Groit, and Brabham.

MORPHOLOGY AND GENESIS OF SOILS

Soil is the product of forces of weathering and soil development acting on soil materials deposited or accumulated by geologic agencies. The characteristics of a soil at any given place depend on the physical and mineralogical composition of the parent material, the climate under which the soil material has accumulated and existed since accumulation, the plant and animal life in and on the soil, the relief, or lay of the land, and the length of time the forces of soil development have acted on the soil material. External climate is less important in its effects on soil development than is internal soil climate, which depends not only on temperatures, rainfall, and humidity, but on the physical characteristics of the soil or soil material and the relief, which, in turn, strongly influences drainage, aeration, run-off, erosion, and exposure to sun and wind.

Pickens County lies in both the Red and Yellow Podzolic and the Gray-Brown Podzolic soil regions of southeastern United States. About four-fifths of the county is in the upper part of the Piedmont physiographic province, which includes some of the foothills of the Blue Ridge, and this part is in the Red and Yellow Podzolic region. The remaining one-fifth, or the north-central and northwestern parts of the county, is in the Blue Ridge province, which is in the Gray-Brown Podzolic region. The elevation of the part in the Piedmont

province ranges from about 725 to 1,250 feet above sea level, whereas the elevation of that in the Blue Ridge province ranges from about 1,250 to 3,548 feet. Surface drainage is good on practically all of the upland soils.

There is a striking contrast between the characteristics of the profiles of the soils of the piedmont section and those of the Blue Ridge, or mountainous section. Although the soils of the mountainous section have developed from essentially the same weathered rock materials as have some of the soils of the piedmont section, the differences in elevation and climatic conditions have had a marked effect on soil development. The soils of the piedmont section show some podzolization and laterization, whereas the soils of the mountainous section are definitely more podzolic. In the piedmont section the A horizons are leached, light-colored, and sandy-textured, and the B horizons are of generally heavy dominantly red stiff clay. The Porters soils, with brown loam A horizons and reddish-brown clay loam or friable clay B horizons, have developed in the mountainous section.

The original forest growth consisted mainly of deciduous trees, including many species of oaks, together with some hickory, chestnut, beech, birch, tuliptree, and less shortleaf or pitch pine. The hardwoods predominated in the mountainous section, and some balsam and spruce grew along some of the mountain streams.

Having developed under forest cover, the soils are naturally low in organic matter. The soils of the mountainous section have a slightly higher content of organic matter than those of the piedmont section. This is due to the fact that they have developed under different climatic conditions and oxidation of the organic matter has not been so rapid. The average temperature is from 4° to 6° F. lower and the average rainfall 6 to 8 inches higher. The soils of the forested areas of the piedmont section have a very thin covering of partly decomposed organic debris on the surface, and the uppermost 1 or 2 inches of the surface layer contains a small quantity of organic matter mixed with mineral particles.

The surface soils are predominantly light in color, ranging from light gray or brown to reddish brown or red. Leaching of the soluble nutrients and alkaline earths is continuous throughout a large part of the year, as the ground seldom freezes to a depth of more than a few inches and then for only short periods. Although some of the rocks from which the soils are developed contained lime, no accumulation of calcium carbonate occurs in the soils.

On the cultivated soils accelerated erosion has been active, not only on rolling and hilly lands but also on undulating and gently rolling areas. In many places the original surface soil has been removed, exposing the subsoil; in other places gullies are beginning to form or have already cut their way down into the C horizon. Erosion has changed the texture of many of the cultivated soils and in many places has been responsible for the removal of materials from the higher to the lower areas. Much of the finer material of the sandy loam and clay loam surface soils has been carried away by surface erosion and by the movement of rain water through the soils.

On the hilly, steep, and mountainous lands that have never been cleared, geologic erosion has been active. Evidence of this is afforded

by the many small and intermittent drainageways and by the shallow development of a profile in places.

The upland soils of both the Piedmont province and the Blue Ridge province have developed in place through soil-forming processes acting on the weathered material of underlying rocks, which are very old crystalline rocks consisting mainly of gneiss, granitic gneiss, hornblende gneiss, and quartz mica schist, with small dikes of hornblende schist, granite diorite, and diabase.

The Cecil, Appling, Worsham, Hayesville, and Porters soils have developed mainly from the weathered products of the gneisses and granites, with small quantities of hornblende gneiss and fine-grained schists. These soils differ in texture, structure, consistence, and color because of differences in relief, erosion, drainage, aeration, oxidation, and climatic conditions.

The Madison soils have developed mainly from the weathered products of quartz mica schist rock, and the Lloyd soils from a mixture of basic and acidic rock materials consisting of hornblende gneiss or schist, diabase, and light-colored gneiss.

The soils of the first and second bottoms along the streams have developed from reworked alluvium or recent geological material brought down from the uplands by streams and deposited in the valleys. The soils of the second bottoms are included in the Wickham and Altavista series, and the soils of the first bottoms are designated as Congaree soils and alluvial soils (Congaree soil material).

Only a small part of the land of the county is smooth enough for the development of a normal soil profile. Gently sloping topography, on which drainage is good but surface run-off is not excessive, seems to be most favorable for the development of normal, mature soil characteristics. The texture profile of a large part of the cultivated soils has been partly destroyed by erosion.

The normally developed soils have light-textured and light-colored surface layers or A horizons. The B horizon is heavy textured, uniformly colored, and well oxidized, ranging in thickness from 2 to 5 feet. The C horizon is exceedingly variable in color and in texture but is prevailingly lighter colored than the B horizon. The A horizons are highly eluviated, whereas the B horizons show rather strong illuviation.

The subsoil layers or B horizons of the Cecil, Madison, Lloyd, and Hayesville soils are well oxidized, whereas in the B horizons of the Appling and Worsham soils the iron is not so well oxidized because of slow drainage and poor aeration.

Table 9 shows the relationship between parent material, soil series, soil types, and profile descriptions of the soils occurring in this county.

TABLE 9.—*Relationship between parent material, soil series, soil types, and profile descriptions*¹ of the soils of Pickens County, S. C.

Parent material	Soil series	Soil type	Profile description
Granites, gneisses, and schists.	Cecil.....	{ Cecil sandy loam.....	{ Light-gray or light-brown sandy loam A horizon and red stiff brittle clay B horizon.
		{ Cecil sandy loam, eroded phase.	
		{ Cecil sandy loam, eroded hilly phase.	
		{ Cecil clay loam.....	
	Appling.....	{ Cecil clay loam, hilly phase.....	{ Reddish-brown clay loam A horizon and red stiff brittle clay B horizon.
		{ Appling sandy loam.....	
	Worsham.....	{ Worsham sandy loam.....	{ Light-gray or grayish-yellow sandy loam A horizon and yellowish-brown or yellowish-red moderately heavy clay B horizon that becomes mottled and streaked with yellow at a depth of 20 inches.
	Hayesville.....	{ Medium-gray sandy loam A horizon and mottled light-gray heavy tough clay B horizon.	{ Light-gray or light-brown sandy loam and loam A horizon and light-red moderately heavy clay B horizon. (Solum not so thick over bed-rock as the Cecil soils.)
		{ Hayesville sandy loam.....	
		{ Hayesville loam.....	
		{ Hayesville loam, hilly phase.....	
Quartz, mica, and schists.	Porters.....	{ Hayesville loam, steep phase.....	{ Light-brown or brown loam and fine sandy loam A horizon and yellowish-brown or reddish-brown friable clay loam B horizon.
		{ Porters loam.....	
	Madison.....	{ Porters loam, smooth phase.....	{ Light-brown or grayish-brown A horizon and red moderately friable clay B horizon grading into friable micaceous clay.
		{ Porters fine sandy loam.....	
Mixture of gneisses, hornblende, schists, and diorite.	Lloyd.....	{ Madison gravelly sandy loam.	{ Brown or reddish-brown clay loam A horizon and dark-red or maroon stiff brittle clay B horizon.
		{ Madison gravelly sandy loam, hilly phase.	
Old alluvium.....	Wickham.....	{ Lloyd clay loam.....	{ Light-brown or brown loam A horizon, and reddish-brown moderately heavy clay B horizon.
	Altavista.....	{ Lloyd clay loam, hilly phase.....	
Recent alluvium.....	Congaree.....	{ Wickham loam.....	{ Light-gray or grayish-brown A horizon and yellow moderately heavy clay B horizon.
		{ Altavista loam.....	
		{ Congaree silt loam.....	{ Light-brown or brown A horizon and light-brown or yellowish-brown B horizon, highly micaceous in places.
		{ Congaree fine sandy loam.....	

¹ In addition to the soil types and phases, four classifications of material or land types are delineated on the soil map, as follows: Alluvial soils (Congaree soil material), rough gullied land (Cecil soil material), rough stony land (Porters and Hayesville soil materials), and rock outcrop.

Table 10 gives the chemical composition of colloids and pH determinations of samples of soils similar to soils of Pickens County.

TABLE 10.—*Chemical composition of colloids and pH determinations of samples of soils similar to soils of Pickens County, S. C.*

Soil type	County from which sample taken	Depth	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	TiO ₂	MnO	CaO	MgO
		<i>Inches</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>
Cecil sandy clay loam ¹	Iredell County, N. C. ²	0-6	32.81	33.68	12.57	1.56	0.43	0.66	0.81
		6-32	33.35	36.44	12.20	1.49	.14	.47	.63
		32-60	35.75	32.22	16.17	1.40	.10	.47	.34
Appling sandy loam...	Elbert County, Ga. ³	0-1	32.70	26.89	8.34	.62	.09	.46	.42
		1-9	35.40	33.21	9.84	.65	.09	.23	.43
		9-14	35.72	35.03	11.84	.60	.05	.10	.39
		14-28	35.10	35.13	13.28	.73	.03	.02	.31
		28-60	37.38	34.68	12.74	.83	.04	.00	.25
Porters loam.....	Rutherford County, N. C. ⁴	0-4	29.58	28.62	8.45	.84	.04	.36	1.02
		14-48	30.33	36.39	8.03	.64	.03	.20	.58
		72-96	39.74	38.41	2.13	.22	.12	.24	.30

Soil type	County from which sample taken	K ₂ O	Na ₂ O	P ₂ O ₅	Ignition loss	Organic matter	SiO ₂ Al ₂ O ₃	SiO ₂ Fe ₂ O ₃ +Al ₂ O ₃	pH
		<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>			
Cecil sandy clay loam. ¹	Iredell County, N. C. ²	0.57	0.24	0.32	16.95	2.30	1.65	1.34	5.6
		.47	.17	.26	14.25	.27	1.60	1.28	4.9
		.35	.19	.31	12.94	.09	1.88	1.43	4.6
Appling sandy loam.	Elbert County, Ga. ³	1.34	.17	.45	27.60	17.52	2.13	1.78	4.1
		1.46	.07	.25	18.45	6.21	1.81	1.52	4.3
		1.29	.09	.18	14.98	1.81	1.73	1.42	4.3
		.79	.07	.26	14.49	.85	1.60	1.40	4.3
		.78	.35	.15	12.98	.34	1.83	1.48	4.2
Porters loam.....	Rutherford County, N. C. ⁴	1.05	.62	.47	29.15	16.41	-----	-----	4.68
		.74	.36	.20	16.75	2.18	-----	-----	5.05
		.52	.38	.24	18.32	3.91	-----	-----	5.10

¹ Cecil sandy clay loam is identical with the Cecil clay loam of Pickens County, S. C.

² From U. S. Dept. Agr. Tech. Bul. 316.

³ From U. S. Dept. Agr. Tech. Bul. 609.

⁴ From Jour. Agr. Res. 40: 469-483.

Table 11 shows the mechanical analyses of samples of soils similar to soils of Pickens County, S. C.

TABLE 11.—*Mechanical analyses of samples of important soils similar to soils of Pickens County, S. C.*

Soil type	County from which sample taken	Depth	Fine gravel (2-1 mm.)	Coarse sand (1-0.5 mm.)	Medium sand (0.5-0.25 mm.)	Fine sand (0.25-0.1 mm.)	Very fine sand (0.1-0.05 mm.)	Silt (0.05-0.005 mm.)	Clay (0.005-0 mm.)	Colloid (0.002-0 mm.)	Organic matter by H ₂ O ₂
		<i>Inches</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	
Cecil sandy clay loam. ¹	Iredell County, N. C. ²	0-6	2.1	6.8	9.2	20.3	13.4	20.2	25.5	17.3	-----
		6-32	1.5	4.5	5.3	11.6	7.7	12.0	56.7	51.2	-----
		32-60	2.6	4.2	3.9	9.0	6.4	17.1	56.8	48.6	-----
Appling sandy loam.	Elbert County, Ga. ³	0-1	13.9	19.0	10.1	12.5	5.2	13.8	10.9	7.8	13.8
		1-9	13.5	19.6	11.5	14.6	8.0	17.0	14.2	9.5	1.3
		9-14	10.8	15.4	9.0	12.9	7.7	18.2	25.3	19.1	.5
		14-28	6.3	7.9	3.6	4.7	3.1	9.1	65.0	60.0	.1
		28-60	5.7	9.9	5.7	8.9	8.1	15.0	46.8	40.0	.0

¹ Cecil sandy clay loam is identical with the Cecil clay loam of Pickens County, S. C.

² From U. S. Dept. Agr. Tech. Bul. 316.

³ From U. S. Dept. Agr. Tech. Bul. 609.

Cecil sandy loam may be considered the normally well-developed or mature soil of the piedmont section, developed from weathered material of gneisses, granitic gneisses, and schists.

Following is a description of a profile of Cecil sandy loam in a wooded area 1 mile southwest of Mount Calvary Church:

- A. $\frac{3}{4}$ to 0 inch, partly decomposed organic debris.
- A₁. 0 to $1\frac{1}{2}$ inches fairly dark grayish-brown friable and mellow sandy loam, well matted with small roots and containing a fair quantity of organic matter.
- A₂. $1\frac{1}{2}$ to 7 inches, yellowish-brown mellow and friable light sandy loam or sandy loam containing a small quantity of coarse quartz grains. This layer contains many small roots but not so many as the layer above.
- B₁. 7 to 10 inches, yellowish-red sandy clay loam that is firm in place but friable and mellow.
- B₂. 10 to 26 inches, red stiff but brittle clay. This material breaks into irregular-shaped lumps or fragments that generally are redder on the outside than on the cut surface. The lumps or fragments crush easily to a crumbly friable mass under normal moisture conditions but are sticky and plastic when wet. This layer contains some sharp quartz grains and a small quantity of finely divided mica flakes, and is permeable to air and water.
- B₃. 26 to 36 inches, light-red fairly stiff but friable clay loam or sandy clay loam. This layer contains a considerable quantity of mica flakes and gritty material and is much more friable than the layer above.
- C. 36 to 50 inches +, light-red soft disintegrated and partly decomposed gneiss or granite gneiss rock material, mottled or streaked with yellow, brown, and gray and containing considerable mica.

Cecil sandy loam, eroded phase, and Cecil clay loam differ from Cecil sandy loam essentially in the texture and consistence of the surface layers.

Table 12 gives the results of mechanical analyses of samples of Cecil sandy loam and Cecil clay loam.

TABLE 12.—*Mechanical analyses of two soils of Pickens County, S. C.*

Soil type and sample No.	Depth	Fine gravel	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay
Cecil sandy loam:	<i>Inches</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
244308.....	0 - $1\frac{1}{2}$	11.3	21.0	13.3	20.1	6.7	19.4	8.2
244309.....	$1\frac{1}{2}$ - 7	11.8	15.7	11.9	23.4	9.4	18.4	9.4
244310.....	7 - 10	8.9	13.6	10.5	19.9	8.7	18.1	20.3
244311.....	10 - 26	4.9	6.4	4.8	8.7	4.4	9.8	61.0
244312.....	26 - 36	8.8	12.8	8.4	15.3	7.0	9.0	37.8
244313.....	36 - 50+	11.3	19.8	11.6	19.2	7.7	9.9	20.5
Cecil clay loam:								
244325.....	0 - 2	8.6	18.5	9.5	13.6	4.3	17.6	27.9
244326.....	2 - 6	6.1	14.7	9.4	14.6	5.2	17.5	32.5
244327.....	6 - 30	3.1	9.5	6.6	10.3	4.4	14.5	51.6
244328.....	30 - 38	7.8	11.9	5.2	8.0	4.1	16.4	46.6
244329.....	38 - 54+	10.5	18.1	9.8	14.7	7.0	18.8	21.1

Lloyd clay loam differs from Cecil clay loam in that it has developed through soil-forming processes from the weathered products of rock high in basic minerals, such as hornblende gneiss or a mixture of basic and acidic rock. In the color and consistence of its soil horizons Lloyd clay loam is intermediate between Cecil clay loam and Davidson clay loam. Its surface soil and subsoil contain less quartz sand than the corresponding layers of Cecil clay loam and more than the corresponding layers of Davidson clay loam, and its B horizon contains more lime and less potash than the B horizon of the Cecil soils.

The soils of the Hayesville series differ essentially from those of the Cecil in that the B horizon is lighter red, more friable, and more variable in thickness. In general it is not so thick as the corresponding layer of the Cecil soils. The rolling and steep phases of the Hayesville soil are more variable than the soils developed on the smoother areas.

Appling sandy loam has developed from the same material as Cecil sandy loam, but it has developed on a comparatively smooth surface on which drainage is not rapid enough to allow the thorough oxidation and dehydration necessary for producing the red color found in the Cecil soils. The Appling soil may be considered a pale Cecil soil.

Worsham sandy loam has not developed a mature or normal profile because of poor drainage and lack of aeration, particularly in the B horizon.

The Madison soils in general are not uniformly well developed in Pickens County. This is due in part to the slow rate at which the quartz mica schist rock material decomposes. The Madison soils that have well-developed profiles differ essentially from the Cecil soils in having finer materials throughout and shallower and more friable B horizons. All layers of this soil have a high content of mica.

Following is a description of a normally developed profile of Madison gravelly sandy loam observed seven-tenths of a mile west of Wolf Creek School in a wooded area just north of the State highway.

- A_o. $\frac{3}{4}$ to 0 inch, partly decomposed organic debris.
- A₁. 0 to 1 inch, fairly dark grayish-brown gravelly sandy loam containing a small quantity of organic matter. Angular quartz gravel and platy fragments of quartz mica schist are scattered over the surface.
- A₂. 1 to 6 inches, yellowish-brown friable and mellow gravelly sandy loam containing enough mica to give the soil a slick feel and a shiny look when pressed between the fingers. This layer contains some platy quartz mica schist fragments and a small quantity of quartz gravel.
- B₁. 6 to 10 inches, reddish-brown firm but friable sandy clay loam, also high in content of mica and containing some quartz mica schist fragments.
- B₂. 10 to 24 inches, red stiff but friable and brittle clay that breaks into irregular lumps that crumble readily to a friable mass. This layer is higher in content of mica and more friable than the corresponding layer of the Cecil soils.
- B₃. 24 to 28 inches, light-red highly micaceous very friable clay, having a slick feel when pressed between the fingers.
- C. 28 to 30 inches +, light-red, mingled with yellow and gray, soft disintegrated and partly decomposed quartz mica schist rock.

Like the Cecil and Appling soils of the Piedmont province, the Porters soils have developed from the weathered products of gneisses, but they have developed at higher elevations than the soils of the piedmont. Their elevations range from 1,500 to 3,400 feet above sea level and consequently they have developed under different climatic conditions. The principal differences in the soils of the two physiographic divisions in the county are in color and structure of the different horizons. The Porters soils contain more organic matter than the soils of the piedmont because they have developed under conditions of higher rainfall and lower temperatures. Vegetation is more dense because of the higher rainfall, and oxidation of the organic matter is not so rapid because of the lower average temperature. The subsoils are lighter textured and more friable than the subsoils of the Cecil and Appling soils.

Following is a description of a profile of Porters loam in a forested area about 1 mile north of Rocky Bottom:

- A. 0 to 2 inches, dark-brown mellow and friable loam, high in content of organic matter and well matted with small roots. There is a thin layer of organic debris or leafmold on the surface.
- Az. 2 to 9 inches, brown mellow and friable loam containing a fair quantity of well-decomposed organic matter and some gritty material. This layer also is well matted with roots.
- B. 9 to 25 inches, yellowish-brown to faint reddish-brown mellow and friable loam or clay loam containing considerable gritty material and some small rock fragments. This layer has a weak granular structure and is slightly sticky when wet. Some small and large roots have penetrated the material.
- Bs. 25 to 35 inches, yellowish-brown sandy clay loam containing more gritty material and smaller rock fragments than the layer above. The material in this layer, however, has about the same consistence as that in the layer above.
- C. 30 to 50 inches +, mingled light-gray, white, and yellow soft disintegrated and partly decomposed gneiss rock.

Porters fine sandy loam differs from Porters loam in the texture of the surface layer; also, the content of organic matter is lower in the surface layer, and the color and the depth of the B horizon are more variable.

The Wickham and the Altavista soils have developed from old alluvium on the second bottoms or terraces that are above normal overflow. These soils have rather definite profile characteristics. Wickham loam generally occurs on higher benches than Altavista loam, and consequently its drainage is better, its subsoil more highly oxidized, and its profile more mature or normal.

Congaree silt loam, Congaree fine sandy loam, and alluvial soils (Congaree soil material) occupy the first bottoms along the streams and are composed of recent alluvium. New material is added by each overflow, and therefore no definite profile has developed. On the better drained areas, where the color and structure are fairly uniform, the soils are designated as Congaree silt loam and Congaree fine sandy loam, but on other areas the alluvial materials (Congaree soil material) are so variable in color, texture, structure, and drainage that they cannot be classed as separate soil types.

SUMMARY

Pickens County is in the northwestern part of South Carolina. Slightly less than four-fifths of the county lies in the Piedmont physiographic province, and the rest lies in the Blue Ridge province of the Appalachian Highlands. The elevation of the piedmont section ranges from about 725 feet to 1,250 feet above sea level, whereas in the mountainous, or Blue Ridge section, the elevation ranges from about 1,250 to 3,548 feet. The relief of the Piedmont province sections ranges from nearly level, undulating, and rolling on the broad inter-stream areas to strongly rolling, hilly, or steep in places near the streams; the relief of the Blue Ridge province sections is steep and mountainous. Both the piedmont and the mountainous sections have been dissected thoroughly by drainageways, and all the soils of the uplands are well drained, as both perennial and intermittent streams ramify all parts of the county.

The climate is mild and healthful and favorable for the production of a great variety of crops. The mean annual temperature in the

piedmont section is about 61° F., and the mean annual temperature in the mountains is from 4° to 6° lower. Rainfall is adequate and well distributed. The highest rainfall is during the summer, or the growing season, and the lowest is during the fall, or the harvest season.

The soils were forested originally with deciduous trees together with some Georgia pine. The early settlers confined their farming operations to the growing of corn, oats, wheat, and subsistence crops that could be used at home and to the raising of cattle and hogs.

About 27 percent of the total land area in Pickens County is devoted to cultivated crops. The rest is either abandoned land—that is, land that has become eroded, leached, and in places unsuitable for cultivation or for pasture—or is in forests. Cotton is the main cash crop, and corn, oats, wheat, forage crops, sweetpotatoes, garden vegetables, and a small quantity of orchard fruits are the main subsistence crops. Pickens County rates as one of the best counties in the State in acre yield of cotton. In the production of crops or in the use of the land relief is the most important factor.

The soils of the uplands have developed in place through soil-forming processes from the disintegrated and weathered material of underlying rocks, mainly gneisses, granites, schists, and dark-colored basic rock. The soils on the terraces and in the first bottoms have developed from old alluvium and recent sediments brought down from the uplands by the streams.

The soils vary in the color, texture, and depth of the surface layers and also in the color, texture, structure, and consistence of the subsoils. This variance is due to some extent to the differences in the character of the parent material from which the soils have developed. Relief, erosion, drainage, aeration, oxidation, and climate are important factors in the development of these soils. Most of the surface soils are light-colored, ranging from light gray or grayish yellow to reddish brown, whereas the subsoils are dominantly red stiff brittle clay. On the bases of relief, agricultural use, and crop adaptation, the soils of the county are placed into four broad groups.

The soils of the smoother uplands, terraces, and well-drained bottom lands include Cecil sandy loam; Cecil sandy loam, eroded phase; Appling sandy loam; Madison gravelly sandy loam; Worsham sandy loam; Hayesville sandy loam; Hayesville loam; Cecil clay loam; Lloyd clay loam; Wickham loam; Altavista loam; Congaree fine sandy loam; and Congaree silt loam. These soils have the smoothest relief of all the soils of the county and are by far the most important agricultural soils. They produce the greater part of the cotton, corn, small grains, hay crops, sweetpotatoes, garden vegetables, and fruits. Cotton occupies the largest acreage on the soils of the uplands, and corn, small grains, and forage crops occupy smaller proportionate acreages in the order given. Practically all of the soils of the uplands are fertilized, but the Congaree soils may or may not be fertilized for corn and hay crops.

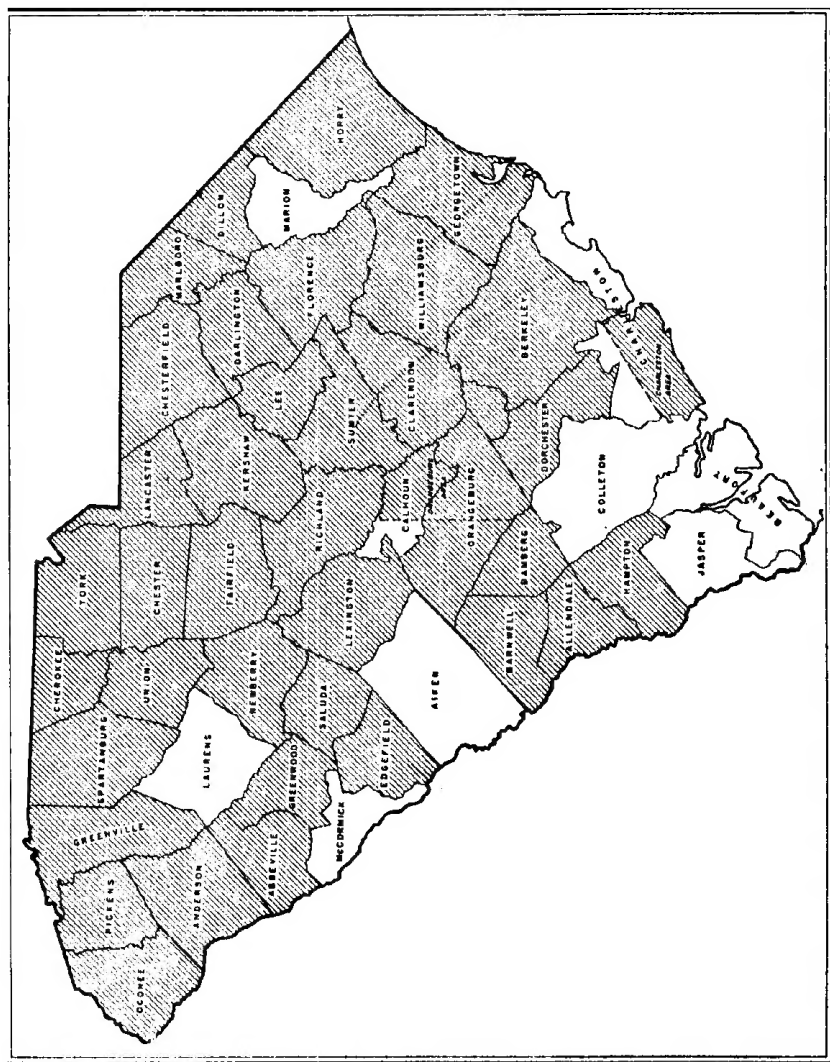
Soils of the hilly uplands, which range from rolling to hilly and have a gradient of 12 to 28 percent include the hilly phases of the Cecil, Madison, Lloyd, and Hayesville soils and Porters loam, smooth phase. The soils are not so extensive as the soils of the first group, and a much smaller percentage is cultivated. They are used, however, for growing general farming crops. A large percentage of these soils

is either abandoned or forested. Because of their steeply sloping relief, these soils are subject to serious erosion under clean cultivation. Terracing and strip cropping or growing grasses are essential to control run-off of surface water, prevent serious erosion, and hold the soils for limited cropping purposes.

Soils of the steep and mountainous areas comprise the typical Porters soils and the steep phases of the Madison and Hayesville soils. The slopes range from short, choppy, and broken to fairly long and smooth. This land is used for forestry and grazing. The Porters and the Hayesville soils support some fairly good hardwood and pine timber.

Miscellaneous soils and land types represent local conditions rather than true soil types. Owing to poor drainage, erosion, texture, relief, and stoniness, the best possible use for this land is for grazing and forestry. Where not too wet, alluvial soils (Congaree soil material) is good soil in summer. Rough gullied land (Cecil soil material) is of some value for grazing, and rough stony land (Porters and Hayesville soil materials) is best adapted to forestry.

The Cecil soils are the most extensive and the most important cultivated soils of the uplands. They are well suited to the production of cotton, small grains, leguminous crops, grasses, summer vegetables, and orchard fruits, and are capable of being built up and maintained in a fairly productive state. The acreage of Hayesville, Madison, Appling, and Lloyd soils is small in comparison with that of the Cecil. On similar relief the Hayesville soils are as productive for general farm crops as the Cecil, whereas the Madison and Appling soils are slightly less productive. Inherently the Lloyd soils are the strongest of the group and are especially adapted to the production of small grains, leguminous crops, and grasses. The Congaree soils are well adapted to the production of corn and forage crops.



Areas surveyed in South Carolina shown by shading.

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Scale 1 inch=1 mile

Polyconic projection, 1927 North American Datum.
Horizontal control by U. S. G. S., and U. S. C. and G. S.
10,000 foot grid based upon South Carolina (North)
system of plane coordinates.
Surveyed in 1934-37. Series 1937.